MEETING THE PREVENTATIVE CARE NEEDS OF OLDER AMERICANS: IDENTIFYING KEY SOCIAL RISK FACTORS FOR CARDIOVASCULAR DISEASES

By

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ABSTRACT

Background: Preventive medicine recommendations targeting cardiovascular health in older adults are scarce. A main obstacle towards generating preventive recommendations targeting older adults is the exclusion of older adults from randomized clinical trials and the subsequent evidence gaps regarding cardiovascular health determinants in American older adults.

Objective: This research aims to identify key social risk factors for cardiovascular health to better inform preventive medicine recommendations for American older adults.

Methods: Participants (N=7,197) were drawn from the Round 1 of the National Health and Ageing Health Study (NHATS 2011), a prospective nationally representative panel study of Medicare beneficiaries older than 65 years. To measure cardiovascular health, cardiovascular risk factors and diagnosed diseases were combined to calculate the Risk of a Cardiovascular Event score (ROCE). The ROCE score combines cardiovascular risk factors (HBP, diabetes, abdominal obesity, depressive symptoms, and smoking habits) and the presence or history of cardiovascular and respiratory diseases (myocardial infarction, heart disease including angina or congestive heart failure, stroke and/or emphysema, asthma, or chronic bronchitis). Based on their ROCE, participants were classified as low, moderate or high risk of a cardiovascular event. Perceived neighborhood social cohesion (PNSC) was measured using a self-reported scale, and street disorder was assessed by the NHATS interviewer.

Results: After adjusting for sociodemographic factors, baseline health status and healthcare utilization, low perceived level of neighborhood social cohesion (PNSC) and a high level of street disorder were associated with higher likelihood of belonging to the high risk ROCE group. PNSC was categorized in 7 levels: from lowest level of social cohesion (score 6) to highest level, with score 0 which was the reference category. When compared with the highest or "perfect" PNSC, the lowest score (6) is associated with 44% higher chance of belonging to the high-risk group of ROCE (p= 0.037), score 5 is associated with 55 % increase (p=0.009), score 4 is associated with 42% increased odds (p= 0.006), score 3 is associated with 18% increase (p=0.052), scores 2 with 13% increase (p=0.198) and, finally score 1 showed no increase (p= 0.571). Regarding street disorder, the presence of litter, graffiti or vacant houses in the neighborhood is associated with 25% (p=0.061) higher chance of being in the increase in the high-risk group of ROCE. When the PNSC association was studied with each risk factor and cardiovascular disease it was observed that low PNSC is associated with increased risk of reporting diabetes [OR=1.37 p<0.01], tobacco use [OR=1.43 p<0.05], depressive symptoms [OR= 1.43 p<0.01], heart disease [OR=1.22 p<0.1], heart attack [OR=1.30 p<0.1], stroke [OR=1.29 p<0.1] and, lung disease[OR= 1.38 p<0.01]. Regarding street disorder, there was a significant association with increased odds of reporting lung disease [OR=1.52 p<0.05].

Conclusions: American older adult's cardiovascular health is related to their neighborhood built and social environment and their diagnosed diseases. Taking into account this association could help develop more efficient and equitable preventive medicine policies and interventions that would help maintain health status during the latter years of life.

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: Introduction and Background Literature

"I believe that the community - in the fullest sense: a place and all its creatures - is the smallest unit of health and that to speak of the health of an isolated individual is a contradiction in terms." Wendell Berry.

1-1 Introduction and Rationale

This study uses data from the National Health and Aging Trends Study (NHATS) survey from 2011 to explore the relationship between social risk factors, cardiovascular risk factors, and cardiovascular disease among older adults. NHATS surveys annually a nationally representative cohort of Medicare beneficiaries aged at least 65 years from every state except for Alaska, Hawaii, and Puerto Rico. The NHATS sample represents Medicare beneficiaries from the 48 contiguous states in the US. The survey is a unique source of information to understand current trends and dynamics among American older adults' in their functioning and wellbeing. The survey collects information through in-person interviews with the older adult or with a proxy person in case the participant can't respond. NHATS is a powerful tool to get a broad picture of the aging phenomenon in the US, as it collects comprehensive information regarding older adults' physical and cognitive capacity, social, physical, and technological environment, and, psychological status and wellbeing. The premise of this study is that by understanding social context and cardiovascular risks among older adults it will be possible to better tailor treatments and provide preventive services. The wider context of this research is an engagement with the public health literature on the social construct of aging, cardiovascular disease prevention, and health disparities among older adults.

The Construct of Aging

NHATS is a nationally representative survey of older adults, which provides a window into how different groups across the social spectrum experience aging. As such, central to this research is the phenomenon of aging and how it is understood within the life-course in the field of public health. Part of what motivated the research questions and the selection of the study sample for this dissertation was the emerging paradigm shift regarding the phenomenon of aging. My prior clinical experience, where the vast majority of patients were older adults, has motivated and shaped my perspectives on health and healthcare policy. The idea that aging was becoming a real threat for our healthcare system was internalized as a "fact." However, this dissertation identifies how public health and clinical actors can reframe aging from a problem to an opportunity. For me, this paradigm change started while reading the book "Ageing" by Chris Phillipson[1]. Phillipson writes persuasively about ageism, inequalities, and how different societies construct aging. For example, aging has been framed as a threat to society, based on a theory of inter-generational competition for existing resources. This negative way of understanding aging rests on certain assumptions and values to the exclusion of alternative conceptualizations of human development which frame aging more positively (e.g., inter-generational solidarity). Unfortunately, there is little explicit discourse in public health literature on aging as a social construct – rather it is accepted as a social problem with measurable social costs. For instance, the general media uses terms like the "Silver Tsunami" [2] which sees aging as a destructive and scary natural disaster. Unfortunately, that term has permeated into scientific literature and first line journals like NEJM have published papers implicitly impregnated with this negative construction.[3–12] I

argue that an engagement with the discourse about the social construction of aging would be valuable during the training of researchers in public health, and provide insights from the literature on the philosophy of science, in the words of Karl Jasper, "by remaining in living touch with the sciences philosophy dissolves the dogmatism (that unclear pseudo-philosophy) which tends to spring up in them again and again".[13] Exposure to alternative paradigms of aging in public health curriculum could reshape the implicit assumptions that undergird research questions in this field.

Clearly, it is a challenge for our societies in general and our healthcare systems in particular to adapt to the reality of aging. There is plenty of data to support the premise that our healthcare system is expending the majority of its resources on older adults. However, aging is also an opportunity to better understand health dynamics in our society and to restructure our healthcare system to be both more efficient and more humane. Such an approach within public health research could help us define human development to the aged population in a more fair, sustainable and, balanced way. This research aims to contribute to a body of research that contextualizes the health and well-being of older adults as an important and valuable stage in the life course.

Prevention and Cardiovascular Health Disparities among Older Adults

This dissertation also aims to contribute literature on a public health approach to prevention among older adults. Prevention is one of the most commonly used words when talking about the future of healthcare and health policies, yet it is argued that it is not a well-defined term from a conceptual standpoint. The definition of primary, secondary and tertiary prevention talks mainly about "when" to prevent. But there are more aspects to define, specifically *what* to prevent and *how* to do it. In a seminal article,

Barbara Starfield and coauthors asked whether the concept of prevention might actually be "a good idea gone astray."[14] In her article, Starfield examines the various definitions of prevention, the focus of the prevention field on specific risk factors rather than on quality of life and wellbeing outcomes, and the reliance on clinical trials of preventive interventions using a medical model and excluding social risk factors in representative populations that could address health inequalities

Indeed, the need to work towards addressing health inequalities is another pillar of this study. A major function of public health research is to identify the causes of health disparities and to propose interventions and policies that promote health equity across vulnerable populations. To that end, this research examines the social aspects of cardiovascular disease, particularly through the neighborhood social environment. The analysis presented in Chapter 3 uses neighborhood social cohesion and neighborhood disorder as the main dependent variables. These indicators were chosen first, based on the premise that environments are modifiable and therefore open to intervention, and second that environments particularly affect older adults since they spend more time in their residences once retired.

For example, it is unlikely that an older adult living in a neighborhood with low social cohesion will engage in physical activity in the neighborhood[15,16]. Were healthcare providers aware of this barrier to physical activity for their patient, they might be motivated to identify alternative settings or resources for the patient. The importance of social cohesion for well-being and physical activity has been supported by extensive research in the field of the social epidemiology [16–19]. Yet to date these findings about the social determinants of health have not been incorporated into clinical practice and

evidence-based preventive practices. In fact, some may believe that the social determinants of health are beyond the scope of medical practice and the health care setting[20]. This dissertation challenges that perception, and argues that social determinants of health can be identified and provide useful information to healthcare providers and their patients.

The leading contributors to disease burden in older people are the cardiovascular diseases (CVDs)[21]. The approach to CVDs in this study is innovative for a number of reasons. First, it includes depressive symptoms in the cardiovascular risk equation. This is not a classic risk factor even though there is extensive evidence that depression increases cardiovascular risk.[22–26] Though there is evidence that depression is a risk factor for CVD, some argue not to include it as an independent risk factor is since it lacks a clinical trial.[23] Yet, neither does high density lipoproteins, and they are often included in cardiovascular research.[26] Still, while the scientific community waits for a definitive clinical trial to determine that depression is an independent risk factor of cardiovascular disease,[23] it seems reasonable to include depression as a risk "marker" in this study. Unfortunately, mental health and its associated stigma are too often overlooked in medical research. In fact, research shows that only 3% of Australian cardiologists screen for depression.[23] Moreover, some people (including clinicians) believe that being somewhat depressed can be a normal part of aging and therefore it is of particular importance to include it in our research and challenge that misperception[27]. Furthermore, CVD diagnosis can co-occur or be followed by depression and exacerbate one another so depression is a key element to be considered for research and management of CVDs.

Finally, another contribution of this research is that cardiovascular risk factors are studied together in the analysis. Cardiovascular risk factors co-occur in older adults and this research aims to study people's health as they present in the doctor's office (i.e., obese, depressed and with hypertension). Pooling risk factors is a difficult task since it requires integrating knowledge form different fields (cardiovascular health, mental health, diabetes, smoking, obesity, tobacco use, social epidemiology, preventive medicine and aging). This research attempts to create a risk scale that brings together insights from these fields.

1-2 Research Questions and Specific Aims

This dissertation examines the relationship between cardiovascular and social risk factors and cardiovascular disease, using data from the first round of the National Health and Aging Trends Study (NHATS) from 2011. It distinguishes three categories of NHATS respondents regarding their **Risk of Cardiovascular event (ROCE)** status. The categorization was made using the number of cardiovascular risk factors and history of metabolic, respiratory, and cardiovascular disease. Cardiovascular risk factors identified were: HBP, abdominal obesity, diabetes, depressive symptoms and smoking habits. Also, the presence or history of cardiovascular diseases like stroke, heart attack or cardiovascular disease was taken into account.

- Low risk: Respondents showing less than two risk factors
- Moderate risk: Respondents showing two or more risk factors
- High risk: Respondents showing presence or history of diabetes and/or pulmonary diseases, explicitly emphysema, asthma, or chronic bronchitis and/or any

cardiovascular diseases namely heart attack or myocardial infarction, any heart disease including angina or congestive heart failure and, stroke

Aim 1:

The first aim will explore how cardiovascular risk factors distribute among older adults (age 65 and over). It will look at physiological risk factors: HBP, diabetes, obesity, tobacco use, and, depressive symptoms as well as social risk factors including social assistance, being socially isolated, neighborhood social cohesion, and, street disorder. Additionally, the prevalence of cardiovascular diseases in our sample: heart attack or myocardial infarction, any heart disease including angina or congestive heart failure and, stroke will be described. The prevalence of racial and gender disparities will be examined.

Hypothesis 1A-1: Prevalence of physiological risk factors will be similar to national estimates.

Hypothesis 1A-2: Physiological risk factors will coexist among respondents, 50% of the respondents will show at least two risk factors.

Hypothesis 1A-3: Cardiovascular diseases will be more prevalent among respondents with more than two physiological risk factors than among those with none or one risk factor.

Hypothesis 1B-1: Women will show higher prevalence of depressive symptoms than men.

Hypothesis 1B-2: Women will be more likely to receive social assistance than men.

Hypothesis 1B-3: Women will show lower levels of educational attainment than men.

Hypothesis 1C-1: Diabetes, HBP and Obesity prevalence will be higher in minorities (Blacks and Hispanics) than among whites.

Hypothesis 1C-2: Black persons will report less social cohesion in their neighborhoods

than whites.

Hypothesis 1C-3: Among women, Black women will show the highest prevalence of cardiovascular risk factors.

Hypothesis 1C-4: Among men, Black men will show the highest prevalence of cardiovascular risk factors.

Aim 2

The second aim will examine similarities and differences among the three ROCE status groups (low, moderate and high risk) and in the three domains identified as having an impact on health: socio-economic & demographic, neighborhood characteristics and, medical care & health domains;

Hypothesis 2A-1: Respondents exposed to neighborhoods with lower social cohesion and higher street disorder will have higher prevalence of being in the high risk ROCE group.

Hypothesis 2B-1: Respondents with lower education will have higher prevalence of being in the high risk ROCE group while persons with higher educational attainment will have a higher prevalence in the low risk group.

Hypothesis 2C-1: Black respondents will have higher prevalence in the high risk groups.

Aim 3:

The third aim will examine the relationship of ROCE with social risk factors: gender, race/ethnicity (White, Black, Hispanic, and Other), educational attainment (less than high school, high school and, some college and, bachelor or more), perceived neighborhood

social cohesion and, street disorder. This association will be studied by adjusting for other social risk factors like social isolation and being a social assistance recipient, health status like number of comorbidities and physical limitations, medical care characteristics like type of health insurance and physical activity.

Hypothesis 3A-1: Race and ethnicity will be associated with ROCE. Black respondents will have higher odds of belonging to high risk groups than white participants after adjusting for age, social risk factors, health status, healthcare characteristics and physical activity.

Hypothesis 3A-2: Education will be associated with ROCE. Persons with a Bachelor's degree or higher education will have lower probability of belonging to high risk groups than persons with a high school education or less after adjusting for age, social risk factors, health status, healthcare characteristics and physical activity.

Hypothesis 3A-3: Persons who are Black and have less than high school education will have larger odds of belonging to high risk groups than Blacks with college education; similarly, Whites having a high school education or less will have larger odds of belonging to high risk groups than Whites with college education after adjusting for age, social risk factors, health status, healthcare characteristics and physical activity.

Hypothesis 3B-1: Living in a neighborhood with lower social cohesion and greater street disorder will be associated with higher odds of belonging to high risk groups after adjusting for age, social risk factors, health status, healthcare characteristics and physical activity.

Hypothesis 3C-1: persons reporting walking during the last month for exercise will have lower probability of belonging to high risk groups of ROCE than those who did not walk,

after adjusting for age, physical limitations, number of comorbidities and health care use.

Aim 4:

The fourth aim will examine independently each of the risk factors that form the risk score: depressive symptoms, obesity, tobacco use, HBP and diabetes and the extent to which each is associated with social risk factors: gender, race/ethnicity (White, Black, Hispanic, and Other), educational attainment (less than high school, high school and, some college and, bachelor or more), perceived neighborhood social cohesion and, street disorder. This association will be studied by adjusting for other social risk factors including social isolation and being a social assistance recipient, health status as assessed by number of comorbidities and physical limitations, and medical care characteristics like type of health insurance and physical activity.

Hypothesis 4A-1: Persons who are Black will report significantly high rates than Whites of obesity, tobacco use, HBP and diabetes, adjusting for gender and age.

Hypothesis 4A-2: Persons with a high school education or less will report significantly higher rates of depressive symptoms, obesity, tobacco use, HBP and diabetes than those with bachelor's education, adjusting for gender and age.

Hypothesis 4B-1: Persons reporting living in a neighborhood with lower social cohesion and greater street disorder will be associated with higher rates depressive symptoms, obesity, tobacco use, HBP and diabetes, for Blacks and for Whites, adjusting for gender, age group, and education.

4C-1: Persons reporting walking in the last month for exercise will have lower probability of reporting depressive symptoms, obesity, tobacco use, HBP and diabetes than those who have not walked, after adjusting for age, physical limitations, number of comorbidities and

health care use.

1-3 Background Literature

The Demographic Transition

The 21st century is witnessing a revolution in terms of human aging and life expectancy. The increase in life expectancy and reduction of mortality and fertility is leading most countries to redefine their societal age strata. According to UN Report *World Population Aging 2013* the global share of older adults (aged 60 years or older) is currently 11.7 percent and, by 2050, will reach to 21.1 percent of the world population.[28] This means an increase of older adults from 841 million people in 2013 to more than 2 billion in 2050. While it is often believed that the aging phenomenon belongs to "Western" countries, data show the opposite: presently two thirds of older persons live in low- and middle-income countries (LMIC). Nevertheless by 2050, 8 out of 10 older adults are expected to live in LMICs, which makes aging a truly global phenomenon.

Moreover, this change in societal structure is happening at an unprecedented speed. While countries like France took 115 years to transition from having 6% to 14% of the population older than 65 years, Brazil and China saw that change in just 25 years.[1] The US case reflects the common trend; specifically aging in America is changing with the large group of "baby boomers" born between 1946 and 1964 entering the retirement age, signaling a shift in demographics toward a growing percent of the population being over 65 years of age. By 2050 the population of US seniors is expected to double from 41 to 86 million.[29]

Who are the aged populations? The complexity of the aging definition from a health perspective

From a medical perspective, there are clear milestones for people to be considered to have a "normal" development. By examining indicators such as reflexes, percentile curves for height and weight and cognitive milestones, we can determine if a person is experiencing a normal or abnormal childhood, adolescence, or even youth. However, aging is yet to be understood so well. Although we have good evidence about the aging "quantity" (magnitude, speed, projections), we still lack understanding of its quality. Some scholars argue that this lack of understanding derives from a negative social construct of aging, also called ageism.[30] The negative construction of the aging phenomenon creates a conscious or unconscious belief that aging is inexorably negative and painful. As a result, this assumption impregnates institutions, policies, and research paradigms.[1] In fact, the increase of life expectancy is more often portrayed as a risk or crisis than as a success of human development, particularly when it is framed around the concern of competition for existing resources. In response, news media runs such alarming headlines as the following: "the costs of global aging will be far beyond the means of even the world's wealthiest nations"[2]; and "Silver Tsunami: the addition of 31 million seniors will strain the U.S. health care system as never before."[31]

The increase of chronic diseases associated with aging and their impact on health care service utilization have widely occupied the biomedical discourse. Yet, the aging phenomenon could be seen as a key opportunity to gain better understanding about how health dynamics interact, to identify health determinants beyond the biomedical paradigm, and to redesign the healthcare system for prevention across all the life span.

Indeed, taking care of older adults has been a challenge for our current healthcare system in the United States since it represents a complexity that is not adequately met in our classic approach to care.

To start with, there is an absence of consistent and agreed upon definitions for the variety of terms used to describe aging, such as: older people, pensioner, elderly, aged, and retired. These terms refer to different facets and non-physiological factors intimately linked with the aging phenomenon. For instance, welfare state and retirement policies are based on the expectation of retirement at age 65; this state definition, then, also defines when one becomes "aged" in society. Yet this definition of "aged" happens independently of any physiological parameters. Such a conceptualization of aging presents many challenges in terms of health care research. First it ignores the heterogeneity in health and biological status at age 65 in different people. Second it lacks a clear biological determination, in opposition with other life course periods like childhood or adolescence. And third it intertwines a sociological, biological, and political matrix difficult to untangle and study. This study aims to bring light to some of these aspects of the aging process to better design a healthcare response for older adults' needs.

Changing Healthcare Needs

As the number of aged persons increases, so does their need for health services, not only in quantity but also in quality. The needs of this population are very different from those of the population in 1964 when Medicare was signed into law to address the healthcare needs of older Americans. At that time, the focus was on meeting acute healthcare needs, infectious disease, and injury. In contrast, today we are witnessing the

dominance of chronic disease, which accounts for 70% of health care expenditures.[32] The initial focus in acute disease, the so-called 'vertical approach' to health care, is currently changing to a focus on effectively managing chronic health problems by offering a continuum of care across all levels of the health care system.

This change in the health care approach is not only responding to the epidemiological transition - worldwide there is growing recognition and theory-building on the social determinants of health.[33,34] This evolution of theory and practice requires the biomedical paradigm to evolve into a biomedical-social paradigm. Understanding how human health is affected by physiological and sociological determinants can improve the interaction and coordination of medical and social services maximizing their efficiency and the health benefits for society.[35–37]

This paradigm shift holds important implications across the spectrum of the health care system. Though many argue a social determinants perspective has particularly important implications in the field of prevention, the U.S. Preventive Services Task Force (USPSTF) does not currently include social factors in their recommendations. When the Medicare law was passed 50 years ago, it covered disease and injury, but provided no coverage for preventive services. Since then, Congress has added some preventive services, including mammography, and influenza and pneumonia vaccines. With the passage of the Affordable Care Act (2010), Medicare for the first time covered all preventive services recommended by the USPSTF with level A or B evidence.[38] Clearly, a recognition that elderly persons can benefit from medical preventive services has been a significant step forward, though work remains to incorporate social determinants in the preventative care model.

Geriatric Preventive Medicine in the U.S.

The U.S. Congress established the U.S. Preventive Services Task Force (USPSTF), convened and supported by the Agency for Healthcare Research and Quality (AHRQ), to develop evidence-based, clinical preventive services recommendations [39]. The USPSTF has developed its own methodology to select topics, review the literature, and generate evidence-based recommendations. Since 2005, the USPSTF has had a geriatrics working group to refine USPSTF methodology and processes to "better address the preventive needs of older adults.[40]" This working group has faced many challenges applying the USPSTF methodology for the development of preventive medicine strategies for elderly people. One of the main challenges is the methodology itself since it considers clinical trials as the most valuable source for evidence to support preventative medicine interventions for the elderly. This reliance on clinical trials to generate evidence for prevention is problematic for a number of reasons. First, older adults are often excluded from clinical trials. In addition, people with co-morbidities, a common situation in elderly people, also are frequently excluded from clinical trials. Geriatric disorders are intertwined and have multiple shared risk factors. Therefore, the current vertical scope for prevention of a single disease is difficult to apply to most seniors.

The USPSTF summarizes the current challenges as follows:[1] "Developing recommendations for the geriatric population has been problematic because adverse clinical events that affect the geriatric population (such as falls or fall-related fractures) are:

1 Leipzig, R. M., Whitlock, E. P., Wolff, T. A., Barton, M. B., Michael, Y. L., Harris, R., Workgroup, USPSTFG (2010). Reconsidering the approach to prevention recommendations for older adults. Annals of Internal Medicine,

- Multifactorial in nature
- Require interventions with multiple and sometimes disparate components
- Include multiple domains of functional status and quality of life that are not easily expressed as discrete events
- Older adults are not often represented in clinical trials
- Important outcomes in the geriatric population may not be measured and reported in ways that are conducive to evidence synthesis and interpretation"[40]

The challenge of applying the current methods to evaluate scientific evidence and inform preventive strategies in the elderly is evident. In fact, among all the preventative interventions ever published by the USPSTF only 2 out 94 target seniors specifically. This inattention is clearly problematic, given the size of the elderly population, and the fact that with the increase of life expectancy one person can be considered "aged" during more than 20 years, and the numerous co-morbidities and chronic conditions older adults experience. Therefore, the healthcare system could be missing opportunities to maintain and improve the health of older populations, and failing to adapt to the aging reality. And yet this lack of attention on prevention among the elderly is not surprising when we consider both the lack of appropriate methodology to inform preventive medicine interventions and the ageist constructs that are used to define the ageing process. In the next section, the different perspectives about how preventive medicine should move forward to overcome the difficulties to inform interventions for older adults are

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described.

Prevention of Cardiovascular Diseases

The leading contributors to disease burden in older people are cardiovascular diseases (CVDs)[21]. In the US, 1 in every 4 deaths are caused by CVDs[41] : about 507,000 people died of heart diseases in 2015[42]. But those deaths affect mainly older Americans; 66% of CVDs deaths occur in people age 75 and older.[43] The economic cost of cardiovascular diseases is $121.2 billion for patients older than 65 years in 2009,[43] though the human costs are not so easily measured. While CVDs have been the leading cause of death and disability in the world, it is possible to prevent and treat most of its medical risk factors. The present study creates a score to assess cardiovascular risk, categorizing respondents into three levels: people at low, medium, and high risk of a cardiovascular event. This score, Risk of Cardiovascular Event (ROCE), it is built from cardiovascular risk factors that are treatable and modifiable (High blood pressure, obesity, tobacco use, diabetes and depression). The development of the risk score will be explained in detail in Chapter 2: Methods. The following section provides background literature on the primary components of the risk score.

High Blood Pressure (HBP):

According to the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, someone has hypertension or High Blood Pressure[2] when systolic blood pressure is ≥ 140 mm Hg and diastolic blood pressure is ≥ 90 mm Hg. HBP is a major public health problem. Currently in the US the

[2] This text will use hypertension and High Blood Pressure (HBP) indistinctively

National Health and Nutrition Examination Survey (NHANES) estimates one out of every three adults older than 20 years old has HBP.[44] Most of them are adults older than 60 years old, the age at which the prevalence of HBP doubles to 66.7 % [44]. That means that by 2050 there are expected to be 55.25 million aged Americans in need of a healthcare for HBP. Hypertension is responsible for end-organ damage resulting in retinopathy, chronic kidney disease, cerebrovascular disease, cardiac dysfunction, and atrial fibrillation among others. The lack of symptomatology associated with HBP makes it hard to diagnose and detect, and there is a high number of people unaware of their condition. The NHANES estimates that among those with HBP, 84.1% are aware of having it, 80.7% are actually receiving treatment, and just 53.3% show controlled levels of blood pressure.[44]

Additionally, HBP represents a large driver of health expenses, particularly among the elderly people who do not achieve effective HBP control. The American Heart Association estimates that US health care system spends $73.4 billion annually in HBP as a primary diagnosis.[45] Treatment costs were estimated at $32.5 billion in 2003.[46]

Obesity:

Overweight and obesity are a growing public health threat. In the US, overweight and obesity is most commonly measured through the Body Mass Index (BMI), a ratio using a person's weight and height. Among adults, BMI between 25 and 30 is considered overweight, while a person with a BMI of 30 or higher is classified as obese. Obesity in adults can also be defined through a waist circumference larger than 102 cm in men and 88 cm in women. Waist circumference measures the excess of abdominal fat and it is the

best measurement for obesity among older adults since the sarcopenia or muscular loss associated with age might mask BMI measurements.[47] In 2010, about 35% of US seniors were obese[48] and that prevalence shows an increasing trend since 1999. Among men aged 65 to 74, obesity increased from 32% to 41.5% and, in the aged, 75 and older, the prevalence increased from 17.7% to 26.5%[48]. There are approximately 13 million older adults suffering from obesity in the US[32] Obesity is a big burden for older adults' health; it is not only a major cardiovascular risk factor[49] but it also affects mood, physical activity, quality of life, and sexual life.[50] In 2008 the medical costs of obesity were estimated to be $147 billion.[51]

For the older population, the difference between intentional and unintentional weight loss is significant. Unintentional weight loss might be related to a psychological or physical ailment. In the elderly population, the benefits of intentional weight loss have been controversial. While some authors alert about the dangers of losing weight,[52] others defend its benefits. In 1990, a study among older diabetic patients found that each 1kg weight loss was associated with 3-4 months prolonged survival[53]. While other populations might focus on fat loss, the muscular loss that accompanies ageing must be taken into account. Although the National Obesity Forum states lower-energy diets have no age contraindication, older adults should maintain a healthy body weight with preservation of lean and bone body mass[54]. In any case, there is no controversy about the metabolic benefits of fat loss for seniors[54] and nevertheless there are preventive programs targeting this population specifically.

Diabetes:

In the US, 29.1 million people suffer diabetes (9.3%). Among adults older than 65 years old the prevalence raises to 25.9% (11.2 million people). The distribution of the disease is very different among races and ethnic groups; while American Indians or Puerto Ricans have a prevalence of 15%, and non-Hispanic blacks 13.2%, the prevalence among Non-Hispanic whites is 7.6 %. Diabetes poses a high burden for health; it is highly associated with HBP, CVD, Kidney disease and blindness.[55] In terms of mental health, diabetes has shown association with both depression and anxiety.[56] Particularly for older adults diabetes is associated with higher mortality, reduced functional status and increased risk of institutionalization.[57] The loss of muscular mass, increases in adiposity and lack of physical activity typical in older adults is associated with the age-related insulin resistance.[57] Older adults respond well to diabetes preventive programs with lifestyle interventions.[58] In 2012, diabetes cost $245 billion in direct and indirect costs, $176 billion in direct medical costs and $69 billion due to indirect costs like disability, work loss and premature death.[55]

Tobacco Use:

In 2015 it was estimated that 15.1% of Americans (36.5 millions) were current smokers[59]. According to CDC, tobacco use kills 480,000 persons each year. Although cigarette smoking reduces life expectancy,[49] 8.4% of adults older than 65 years still smoke.[60] Tobacco use has been demonstrated as a strong risk factor for CVD[61] and cancer among other diseases. The US spends more than $300 billion per year due to tobacco use: $170 billion for smoking-related illness direct medical costs and $156

billion in lost productivity. More than 60% of this cost is assumed by public programs like Medicare or Medicaid.[62] Research typically focuses on the benefits of quitting at younger ages. However, recent evidence demonstrates that quitting at older ages is still beneficial.[63] Smoking is a robust independent risk factor of cardiovascular events and mortality, even in older adults. Tobacco use advances cardiovascular mortality by more than five years among older adults, so smoking cessation reduces the excess of risk in this population.[64]

Depression:

The National Health and Nutrition Examination Survey (NHANES) estimated that between 2009–2012, 7.6% of Americans older than 12 years had depression.[65] Among adults older than 60 years the prevalence was calculated to be 5.4%, with important gender differences (females 7.1% and males 3.4%).[65] This prevalence among women is higher than previously reported (5.9% in 2006).[66] There are also disparities in the social distribution of depression, as poor persons are more than twice as likely to suffer from it when compared with persons living above the poverty level.[65] Depression is a widely-used term, both to describe temporal mood changes as well as serious clinical changes that can be disabling and recurrent. Usually being depressed includes depressed mood, loss of interest or enjoyment, sleep problems, fatigue or lack of concentration. Different diagnoses fall under the depression umbrella: dysthymia, grief, adjustment disorder with depressed mood or major depressive disorders. Some authors argue that depression is the most important obstacle of overall quality of life[67].

Despite the fact that there are some specific older life events that can trigger depression, such as loneliness[37] and widowhood,[68] depression is not a normal part of aging. This assumption among healthcare providers and patients results in misdiagnosis and under-treatment of depression in older adults.[69] In terms of health effects, depression has been associated with cardiovascular diseases and cardiac surgery.[22,70,71] Depression is more common among CVD patients and CVD is more common for depressive patients.[67] Additionally, depression has shown association with other cardiovascular risk factors such as smoking, obesity and physical inactivity.[22] Although different studies have associated depression with cardiovascular disease,[24] classic risk assessment algorithms often do not include depression as an independent risk factor.[23] That might explain why a 2009 survey among Australian cardiologists found that just 3% reported using a standard screening tool for depression, and most did not believe they had a major role in the detection and treatment of depression.[25] Nevertheless, improvements in depression have been associated with better adherence to medications and beneficial lifestyle behaviors like smoking cessation and physical activity.[67] In terms of financial burden, the US spent $210 billion to cover the costs of major depressive disorder in 2010.[72]

Social Risk Factors:

The American Heart Association (AHA) made a clear statement about the social determinants of cardiovascular diseases, in addition to already understood physiological, lifestyle, and genetic risk factors. In fact, the AHA argued that: "Failure to demonstrate awareness of this third dynamic will result in a growing burden of CVD, especially in those with the least means to engage in the healthcare system." [73] This study focuses on

the importance of gender, race and ethnicity, and neighborhood characteristics to examine the social risk factors of CVDs.

Gender:

This study makes an explicit analytic distinction between gender and sex. Sex is a biological classification: "The classification of living things, generally as male or female according to their reproductive organs and functions assigned by chromosomal complement." [74] Whereas gender is a social construct: "A person's self-representation as male or female, or how that person is responded to by social institutions on the basis of the individual's gender presentation. Gender is shaped by environment and experience."[74] In the present research study, the oldest respondent in the dataset was born in 1909. To put the life course of this respondent in context, she was 11 years old when the 19th amendment was signed and women won the right to vote (still not a very popular behavior until years later). Therefore, the gender constructs that older adults in the US interiorized during their childhoods have experienced profound changes during their lifetime. It is beyond the scope of this project to review historic gender constructs and their implications for people's health. Nevertheless, it is important to note that the author is aware of the profound negative health impact that the heteropatriarchy structure in gender and sexual orientation has had, both in women and men, and across the gender identity spectrum.

Sex is often studied as a biological determinant for cardiovascular health. It is unquestionable that events such as ovarian cancer, maternity or prostate cancer are sex specific. However, the differences in men and women's health responds to a broader set

of determinants including historic, social, economic, and environmental factors that affect during all the life course and that is why we consider the importance of gender-oriented research.

Gender Differences in Cardiovascular Outcomes:

In 2010, there were 83.6 million Americans suffering from CVD among all ages, 51% were women.[75] Women experience higher rates of cardiovascular diseases than men. In 2007, 60.6% of stroke deaths in the US were among women.[76] However, more men suffer coronary heart disease (CHD), which might contribute to the belief that heart disease is a man's disease.[76] The older population group is mostly comprised of women due their longer life expectancy; thus women have the largest prevalence of cardiovascular diseases. In fact, since 1984 female mortality due to CVDs has exceeded males' absolute number.[77] There has been some questioning about the origins of the gender differences from CVDs. For instance, in the 1990s, studies found that women had worse outcomes than men following myocardial infarction and revascularization. However, some authors argue that this difference might no longer be relevant due to contemporary trends in management and risk factor profiles.[76] Still, there are differences in the 30-day survival after a coronary syndrome, mostly explained by different clinical presentation (older age in women) and differences in severity.[77] In women, chronic coronary heart disease is a key determinant for heart failure. In 2009, it was estimated that 2.5 million women were living with chronic heart conditions, and this number is growing with the aging process.[77] In 2010, statistics show there were 6.8 million stroke

episodes, 3.8 million (56%) occurred in women.[75] Although women live longer than men, women suffer more strokes in age-adjusted groups.[77]

Gender differences in cardiovascular risk factors:

While men smoke more than women[75] smoking rates are declining in both sexes, though the rate is slower in women. Lung-cancer mortality has followed the same pattern.[77]

Smoking is also related with low income and poverty which disproportionally affects more women than men.[78] Another risk factor related to poverty is depression which also affects more women than men (25% of women and 18% of men have a history of any mood disorder).[77] Studies show that specifically older women are less active than males.[79,80] A sedentary lifestyle also relates with obesity that again affects more women than men. Although women consume more fruits and vegetables than men, this does not apply for non-white populations whose diets have worse quality. Residents of food deserts have poor diets when compared with those living in more affluent locations.

Gender differences in cardiovascular healthcare:

In 2005 a survey conducted among physicians showed women's cardiovascular risk was more often underestimated than men's so women were more often misplaced in lower risk group than which they really belonged to[81]. This misclassification also affected lifestyle and treatment recommendations. Although there are evidence-based guidelines for the prevention of cardiovascular diseases in women, there is no evidence about how much they have permeated into the clinical practice.

Race and Ethnicity:

Race and ethnicity are not easy to define. According to the US Census Bureau: **"**The racial categories included in the census questionnaire generally reflect a **social definition** of race recognized in this country and not an attempt to define race biologically, anthropologically, or genetically"[82]. In terms of race, the existing categories in the U.S. Census Bureau are:

White – A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

Black or African American – A person having origins in any of the Black racial groups of Africa.

American Indian or Alaska Native – A person having origins in any of the original peoples of North and South America (including Central America) and who maintains tribal affiliation or community attachment.

Asian – A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.

Native Hawaiian or Other Pacific Islander – A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

In terms of ethnicities, the US Census Bureau also asks people about being Hispanic or Latino and Not Hispanic or Latino. They define Hispanic as: "Hispanic

origin can be viewed as the heritage, nationality, lineage, or country of birth of the person or the person's parents or ancestors before arriving in the United States. People who identify as Hispanic, Latino, or Spanish may be any race." The Office of Management and Budget defines "Hispanic or Latino" as a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race" [83].

Defining racial and ethnic groups for public health research is not a straight-forward endeavor. Although we already know that race and ethnicity are predominantly a socially constructed category,[84] there is still a need to clarify the underlying assumptions about biological components of race. For example, a systematic review about racial differences in spirometry results found that just 17.3% of the research papers explicitly defined the race concept.[85] It is important to acknowledge that the term Caucasian is still used even after having been forbidden by the Council of Biology Editors in 1994[86]. In fact, the idea of "inherent differences" between races is still present in spirometry research papers. As argued by Braun: "The fact that the key variable of race and/or ethnicity used to frame comparative studies on lung capacity was rarely defined over a period of nearly 90 years should, at the very least, raise questions about the reliability of research that reports an association between inherent or genetic racial difference and lung function, and the scientific evidence that underpins the practice of "race correction." While the view that races and ethnic groups differ in the capacity of their lungs is widely accepted in pulmonary medicine, the continued practice of explaining racial and ethnic difference in lung function as rooted in inherent and fixed anthropometric difference has critical health policy implications."[85]

The implicit concept of "inherent differences" between races is still too present in our research. Yet, the Institute of Medicine (IOM) states that racial health disparities result from exposure and vulnerability to psychosocial, behavioral or environmental risk factors and resources.[87] Indeed, the impact of racial or ethnic disparities decreases significantly when social variables like income, education, or insurance status are considered.

Race and Ethnicity Differences in Cardiovascular Outcomes:

Although cardiovascular related mortality has declined in the last decade, the decline has been slower for black adults than for whites, and this disparity significantly contributes to the enduring racial gap in life expectancy.[88] The total prevalence for cardiovascular diseases in 2010 showed that black Americans were most affected, with around 47% of blacks older than 20 years having CVDs. Comparatively, within same age groups the prevalence among whites was 35%, and among Mexican Americans was 32%.[75] Blacks showed also the largest prevalence of stroke (4.5%) vs. 2.7% in whites and Hispanics. In terms of coronary heart disease, the prevalence is less disparate, showing a 7% prevalence vs. 6.4% in whites and 6% among Mexican Americans.[75] Finally, in terms of heart failure prevalence among black American was 3.5%, 2.1% among whites, and 1.5% for Mexican Americans.[75]

Race and Ethnicity Differences in Cardiovascular Risk Factors:

The differences in risk factors are a key component of the cardiovascular disparities observed between individuals of different races and ethnicities. African

Americans suffer higher rates of hypertension (45%) than whites (32%) or Hispanics (20.9%). Additionally, the control of hypertension is worse for black Americans. For tobacco use, we observe that black males show similar prevalence to white men and women (21.6%), while females have less tobacco use (14.2%). Hispanics also show a lower rate of smoking than whites (16.6% among males and 7.5% among females). Regarding obesity (BMI>30 kg/m^2), black women show the highest prevalence (53.9%), followed by Mexican American women (44.8%), African American men (37.9%), white men (33.8%), with the group of lowest prevalence being white women (33.8%). African Americans and Hispanics bear a disproportionate burden of diabetes mellitus, with the highest prevalence (14.5% and 11.7%) while whites show 6.9% prevalence. Finally, African Americans and Hispanics are less like to be physically active when compared to whites.[88]

Race and Ethnicity Differences in Cardiovascular Healthcare

According to the IOM report *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care,*[89] stereotypes about race and ethnicity are key to understand health care providers' clinical decisions: "such stereotyping may be indirect in that it is mediated by distortions or omissions in cross-racial/ethnic physician-patient communication that are, in turn, a consequence of providers' race- or class-based stereotypic judgments of patients' intelligence, likelihood of compliance with recommended regimens, or preferences." It is estimated that blacks are 50% less likely to receive necessary cardiac procedures than whites[88].

Neighborhoods Impact on Health

In this study, neighborhood is defined as the area surrounding residents' homes where daily activities occur.[90] There is evidence that neighborhoods influence health behaviors and health outcomes, and cardiovascular health in particular.[91] [92] [93] Therefore, when identifying cardiovascular risk factors, it is important to consider not only individual characteristics but indicators of the contexts to which individuals live. Local areas are relevant as they have physical and social attributes than could affect the health of individuals.[94]

To review the extent to which neighborhoods affect health, this study uses the classification of exposures from the systematic review "Neighborhood environment in studies of health of older adults," [95] which identified five types of neighborhood aspects:

- **Socioeconomic composition:** Described by the composition of people living in the area, taking into account for example income or unemployment.
- **Racial composition:** Proportion of racial and ethnic groups.
- **Demographics:** Age composition and geographic mobility of the residents.
- **Physical environment and perceived resources and/or problems:** It includes elements as housing density, land use, parks and people's perceptions of traffic, trash or litter, safety/crime and access to services.
- **Social environment:** Perceived social cohesion/support, collective efficacy and neighborliness

In terms of **Socioeconomic composition**, neighborhood social and economic disadvantage has been associated with poor health.[95–97] Moreover, the direct impact of

neighborhood characteristics on cardiovascular health outcomes has been demonstrated: worse neighborhood economic and social conditions contribute to increased risk of CVD among African American women.[98] In fact, residents with more collective economic resources can influence political decision making and obtain more public services, while residents of poorer neighborhoods may be less able to influence in that way.[99]

Regarding **racial composition**, research has shown that living in homogeneous ethnic neighborhoods with a high density of Latinos has a beneficial effect in terms of reduced mortality and depressive symptoms among Latinos.[100] Considering **demographics**, higher density of older adults living in a neighborhood has been linked with better mental health and a protective effect on the probability of reporting poor health.[101] Interestingly, residents in neighborhoods with similar or higher rate of older adults than national levels reported higher generativity[3] and social cohesion which in turn are associated with better self-reported health and higher psychological well-being in older adults.[102] Equally important, the **physical environment** has a strong impact on older adults' health; high population density, land use and proximity of nonresidential destinations affect walking for transportation, while walking for recreation seems to be associated with pedestrian infrastructure, aesthetics, safety and land use mix.[94] Indeed, the existence of parks and the overall condition and appearance of the local environment can play a role in the walking behavior of older adults[94] together with the overall condition and appearance of the local environment.[103,104] The importance of the physical environment is also associated with food access; research shows that residents with better

[3] Generativity: a need to nurture and guide younger people and contribute to the next generation—used in the psychology of Erik Erikson

access to supermarkets and other retail stores with healthy food products tend to have healthier food intakes.[94,105] On the contrary, disorder and neglect at the local level have been described as a deterrent for older adults to walk,[103] and problems related to traffic, public transportation, green spaces and services have been associated with higher levels of depressive symptoms.[94] Likewise, perceived neighborhood danger predicts health[106] and is associated with higher satisfaction with community mobility.[107] Not surprisingly, significant associations have been found between **neighborhood problems** and depression, smoking, and alcohol use.[97] For instance, women in such neighborhoods showed with high stress (related to violence and disorder) and were more likely to smoke.[108] In the same way, sleep problems like insomnia symptoms are associated with neighborhood physical disorder.[109]

Finally, in terms of the **social environment,** it has been shown that social connection and social capital are protective against depression.[94] Higher safety and social cohesion and greater density of social engagement destinations have been found to be associated with lower depressive symptoms.[96] Additionally, older adults living in neighborhoods with high social cohesion and safety had lower incidence of activities of daily living limitations (ADLs)[110] and reported on average higher level of walking[103]. Likewise, social capital indicators like neighborhood trust, support, cohesion and participation was significantly associated with self-rated health, ADLs, and instrumental activities of daily living (IADL) into very old age.[111]

Neighborhood social cohesion:

Neighborhood social cohesion may be defined as the perceived connectedness among neighbors and their inclination to act for the common goal. The concept is also

characterized by the degree of residents' sense of belonging to the area where they live and the degree of trust shared among them. It is a different concept than individual-level social network support, as it characterizes the whole population living in a particular area regardless individual characteristics[93]. The mechanisms than link neighborhood social cohesion and cardiovascular health may work in a similar way to those that link higher individual-level social support and better health outcomes. Perceived neighborhood social cohesion could be a type of social support from outside family and friends located in the social environment that operates creating and reinforcing social norms. These norms may influence well-being by creating incentives for adopting and maintaining certain health related behaviors.[93] For African American women, living in neighborhoods showing high social cohesion was associated with less tobacco use. [108]

As explained earlier, a significant body of evidence has shown the link between neighborhood characteristic and health, but most of it focuses on exposures that harm health. On the contrary, social cohesion can be understood as a positive factor that can enhance health or than can hamper health when there is a lack of it. For example, higher levels of neighborhood social cohesion were associated with higher odds of meeting aerobic physical activity guidelines and more moderate or moderate-equivalent minutes of physical activity per week.[112] Similarly, neighborhood social cohesion plays an important role in protecting against stroke[113] and has been related to lower CVD incidence and mortality.[105] Research that analyzed a representative sample of US adults over 50 years old with no history of heart disease at baseline found that perceived social cohesion was associated with a reduced likelihood of myocardial infarction.[93] The association persisted even after further adjusting for behavioral, psychological and

biological factors.[93] Furthermore, the wellbeing of older adults has been also related to neighborhood social cohesion.[114,115] For those who lived alone, neighborhood social cohesion predicted companionship, with a one-unit increase in neighborhood social cohesion increasing the odds of reporting companionship by half [116]. Recent data also reflect how perceived neighborhood social cohesion is associated with preventive healthcare use, adjusting for sociodemographic factors, influenza immunizations and cholesterol tests increased with higher perceived social cohesion.[92]

CHAPTER 2: Methods

2-1 Introduction

This study examines the relationship between social risk factors, known cardiovascular risk factors and cardiovascular disease outcomes among older adults in the United States. This chapter begins with an examination of the conceptual model that

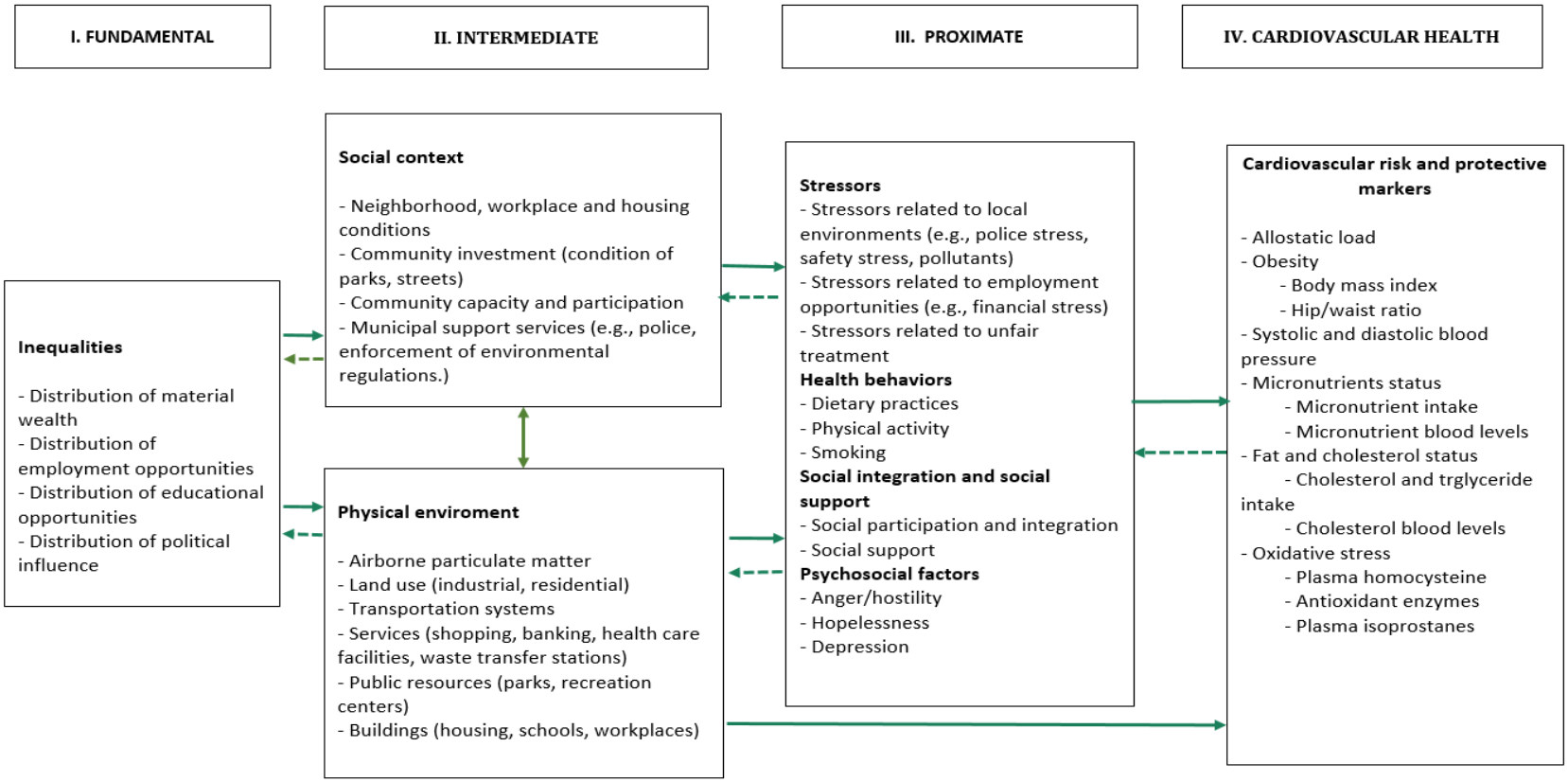
serves as the basis for the analytic model used in this study, which adapts the work of Schulz et al. to the population of older adults. The next section describes the data source used in this study, the National Health and Aging Trends Study (NHATS), and sampling methods to identify the population of interests. The final section presents the study design, dependent and independent variables, and an overview of the statistical analysis.

2-2 Conceptual Framework

Cardiovascular disease conceptual framework description

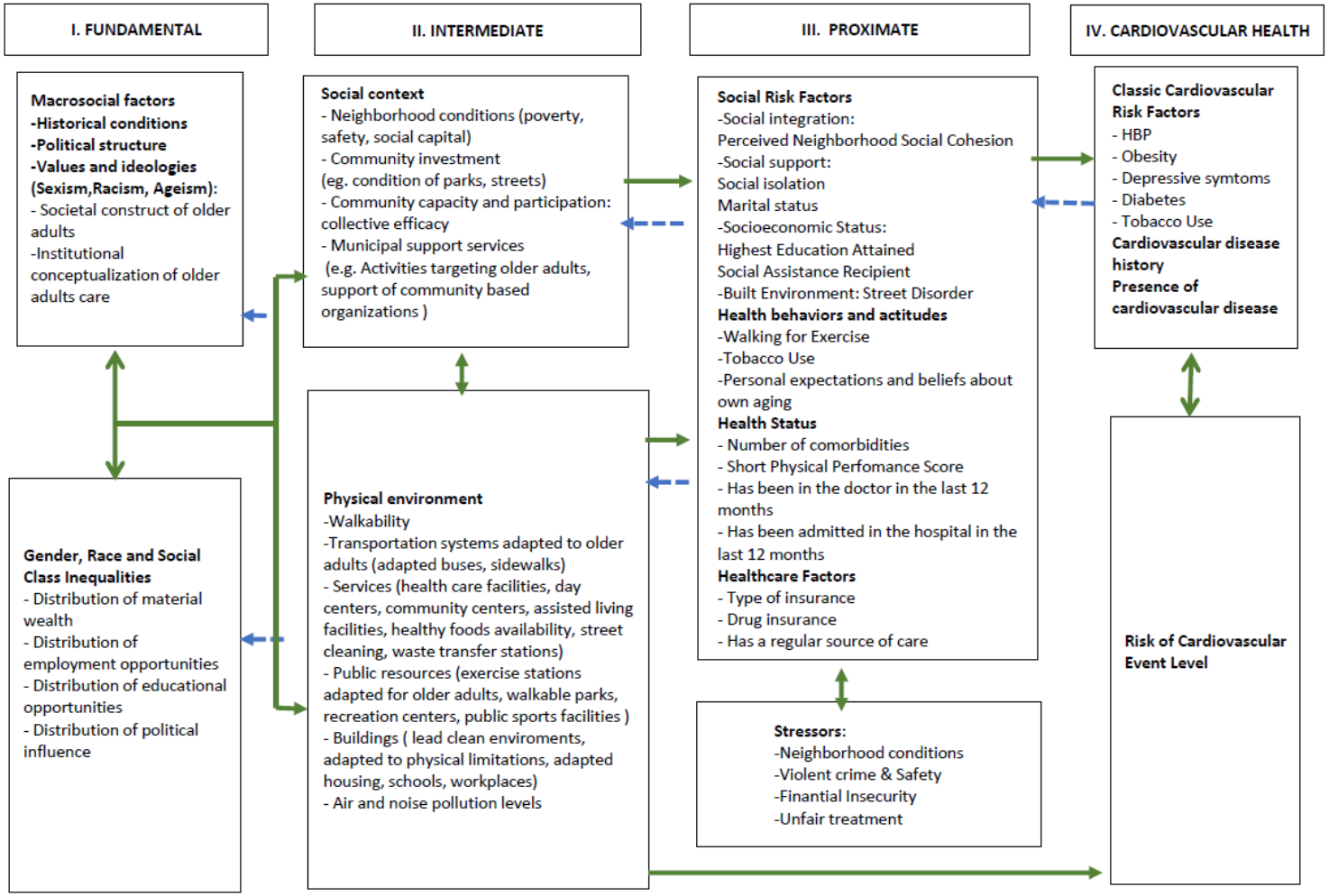
The conceptual framework underlying this research is adapted from the work of Schulz et al. presented in two papers: *Social Determinants of Health: Implications for Environmental Health Promotion* [117] and *Social and physical environments and disparities in risk for cardiovascular disease: The Healthy environments Partnership Conceptual Model* [118]. Schulz's conceptual framework proposes that the social and physical environments serve to mediate relationships between fundamental determinants and inequalities and, more proximate social, psychological, behavioral, and biologic determinants of CVD risk (see Figure 2.1).

Figure 2.1: Social and physical environments and disparities in risk for cardiovascular disease: The Healthy environments Partnership Conceptual Model[4]



[4] Schulz AJ, Kannan S, Dvonch JT, et al. Social and physical environments and disparities in risk for cardiovascular disease: The Healthy environments Partnership Conceptual Model. Environ Health Perspect. 2005;113(12):1817-1825

Figure 2.2: Adapting the Healthy environments Partnership Conceptual Model



Fundamental Factors: Inequalities

Shultz et al. propose that the primordial determinants of cardiovascular health are macrosocial factors. Macrosocial factors include historical conditions, political structure and social values. Historical conditions are intertwined with both political structures and societal values. For example, the history of slavery and racism in the United States, and heterosexism globally, has had a profound impact on minority and women's health. Therefore, to understand the unequal distribution of health outcomes across populations, public health research must contextualize the historical and on-going movements for civil rights and gender equality. This historical perspective is particularly salient for older adults since they have lived school segregation, denial of reproductive rights and general discrimination over their life course, which has affected gendered and racialized health from a myriad of different pathways.

History has indeed shaped political structures and societal values; democracy for instance has inspired the creation of institutions to promote public policies to protect citizen's health. At the same time, those institutions are a reflection of societal values, either positive like solidarity or negative like racism, sexism or ageism. Those ideologies have played an important role in terms of inequalities, resulting in spatial concentrations of poverty, wealth, and even spatial segregation of African Americans and other minorities. In fact, racial or ethnic status largely determines socioeconomic position mainly through discrimination in housing, education and employment opportunities, and, access to other resources necessary to maintain health. Particularly important in the context of this study, the social construct of aging permeates institutions and is

transformed into policies and health care systems that frequently do not meet older adults' needs.

Intermediate Factors: Social Context and Physical Environments

Following the fundamental macro factors are intermediate factors that affect cardiovascular outcomes: the social context and physical environments where older adults live. The model used in this study conceives the social context as determinants at the local level like neighborhood conditions (poverty, safety, social capital) which are intimately linked with the community investment in the area (e.g., condition of parks and streets) and community capacity and participation. In areas of greater concentration of wealth, the collective efficacy to influence political decisions generally far exceed the influence of citizens from deprived areas. Inequalities in access to economic resources influence the ability of residents to participate in political decisions. Localized poverty can mean fewer individuals will seek to influence policy decision-making on issues of importance to the local community, for example, land use and the enforcement of environmental regulations. Exposure to local environmental hazards will likely increase the risk of CVD. Greater political influence and investment in community resources can translate into more support services including providing programs and activities targeting older adults.

The physical environment where older people live can influence their health, quality of life, and the costs and outcomes of heath care. Neighborhood walkability and transportation systems adapted to older adults (i.e., adapted buses, sidewalks) shape opportunities for mobility and physical activity. Additionally, area services, such as

health care facilities, day centers, community centers or assisted living facilities, determine health care accessibility and use. In terms of dietary habits, healthy food availability is important especially for older adults whose mobility and financial resources are limited. Nevertheless, areas with better public resources such as walkable parks, exercise stations adapted for older adults, recreation centers and public sports facilities favor not only physical activity but social contact and interaction. Finally, the built environment reflects the area's wealth distribution and affects not only the proximate health determinants, but also direct health outcomes through exposure to air pollutants, lead, or other environmental risks.

Arrows connecting fundamental and intermediate determinants (seen in Figure 2.1) represent the influences that race-based residential segregation and economic inequalities have on the social and physical environment in which people live. For example, inequalities affect both household income and local taxes that at the same time influence the quality of services that support community life, such as the effectiveness of police force and health care providers, the distribution of educational and employment opportunities, services and retail outlets, pharmacies, park and recreational facilities, groceries stores, fast food and liquor establishments.

Proximate Determinants and Cardiovascular Health

Proximate determinants of cardiovascular health result from the impact of the social context and physical environment at a personal or interpersonal level. As stated above, residents of less affluent areas are more likely to experience crime and violence and thus can suffer from higher levels of psychological stress. Similarly, lack of public

safety affects neighborhood social cohesion and increases the probability of social isolation. This is of special importance for older adults since decline in physical function can impact their ability to perform activities of daily living. Social cohesion and social support become of particular importance to mitigate the health impacts of physical function loss. Furthermore, the physical environment plays a crucial role in this aspect: living in an area with crumbling sidewalks can be the origin of unintentional injuries from falls and can accelerate physical decline. Moreover, the lack of physical activity impacts body weight, increasing the risk of obesity and obesity related illness like diabetes. Lack of safety decreases the outdoor activities and opportunities for social interaction and cohesion. Research has also shown that the body response to persistent stress in life, the allostatic load, can lead to CVDs through the adrenal response. Furthermore, the augmented cortisol and catecholamine's levels from stress contribute to central adiposity and hypertension.

With regards of social class, financial insecurity is associated with higher levels of stress, it also hinders access and quality of health care and limit ability to purchase needed medications for chronic conditions like diabetes, hypertension or depression. Furthermore, in terms of social class and socioeconomic status, there is also a negative association between education and tobacco use, which is associated with a variety of poor health outcomes like CVDs, cancer or oral health.

Finally, gender, race, and age are recognized as social risk factors since they have a fundamental impact on education, employment and housing opportunities, largely defining the social and physical environments in which people live.

Dynamics between determinant levels

The value of adapting the conceptual framework proposed by Schulz et al. is based on its emphasis of the implications of fundamental factors on the physical environment and social context which influence social risk factors, health behaviors, healthcare utilization and stressors that ultimately impact cardiovascular health status. The direction of the associations is bidirectional since there is the belief that fundamental factors can change. For example, the grassroots movement for Civil Rights has had the ability to impact intermediate and fundamental factors like school segregation. The changes are slow and on-going, and therefore hatched arrows were used to depict this relationship case.

2-3 Data Source and Sample Size

This study uses data from the National Health and Aging Trends Study (NHATS). NHATS surveys annually a nationally representative cohort of Medicare beneficiaries aged at least 65 years from every state except for Alaska, Hawaii, and Puerto Rico. Therefore, NHATS sample represents Medicare beneficiaries from the 48 contiguous states in the US. The survey is a unique source of information to understand current trends and dynamics among American older adults' in their functioning and wellbeing. The survey collects information through in-person interviews with the older adult or with a proxy person in case the participant can't respond. NHATS is a powerful tool to get a broad picture of the aging phenomenon in the US, as it collects comprehensive information regarding older adults' physical and cognitive capacity, social, physical, and technological environment, and, psychological status and wellbeing. Interviewers also

conduct performance-based tests of physical and cognitive capacity and collect information regarding the built environment where the person lives. NHATS is conducted by the Johns Hopkins Bloomberg School of Public Health and funded by the National Institute on Aging (U01AG032947). NHATS aims to "to foster research that will guide efforts to reduce disability, maximize health and independent functioning, and enhance quality of life at older ages."[119] NHATS is a useful tool for examining risk and protective factors among elderly including the built and the social environment where older adults live, as well as health status characteristics including functional status (the Short Physical Performance Battery (SPPB)[120]), and presence of cardiovascular diseases and risk factors.

NHATS Sample size, sampling strategy and sample replenishment

The survey uses a three-stage stratified sample design based on U.S. counties. First stage is the selection of 95 primary sampling units formed by counties or groups of counties. The second stage, selection of secondary sampling units, includes 655 ZIP codes or ZIP codes fragments within sampled counties in stage one. The third stage is the selection of participants, oversampling persons older than 85 years and persons who were non-Hispanic black. To identify eligible participants from the Medicare beneficiaries' database, the sample included people:

- who were at least 65 years old as for September 30th 2010
- who resided in one of the 655 ZIP clusters previously sampled by NHATS
- who had no death date in their record

In round 1, 14,643 beneficiaries were selected, larger than the targeted sample to allow for a 20% reserve. 11,961 beneficiaries were selected for interviews, with the number of completed cases at 8,245. The NHATS unweighted response rate was 70.9%.

The complete information about sampling methods in Round 1 can be found in the NHATS Technical Paper #1.[121]

Study inclusion and exclusion criteria

This study uses the information from the initial interview of NHATS cohort. A cross-sectional analysis was undertaken using data from the 8,245 participants in Round 1. Since the analysis focused on community-dwelling adults, participants residing in residential care or nursing homes were excluded. The final sample excluded a total of 1,048 respondents (12.7% of the initial sample). Although estimates were restricted to community-dwelling adults, the statistical analysis used the whole sample to calculate the standard errors of the estimates (the statistical programming used the *svy subpopulation* strategy in Stata).

2-4 Study Design

Response variables:

This study examines both a composite score for Risk of Cardiovascular Event (ROCE) and its components individually.

Risk of cardiovascular event (ROCE)

A response variable, the Risk of Cardiovascular Event (ROCE), was created for this analysis. The ROCE variable synthesizes information about cardiovascular risk factors and the history of cardiovascular disease among NHATS respondents. To inform the development of this variable, different cardiovascular risk stratification scales were

reviewed. Among the most foundational risk scores is the *general cardiovascular risk profile for use in primary care* from the Framingham Heart Study,[122] which predicts the risk of any CDV event based on presence of risk factors (age, total and high-density lipoprotein cholesterol, systolic blood pressure, treatment for hypertension, smoking, and diabetes status). This score presented some obstacles to apply to this dataset; first, it does not take into account presence or history of cardiovascular events or diseases and this prevalence is large in our sample of older adults. Similarly, the Framingham general cardiovascular risk profile does not use depression as a risk factor; NHATS does screen for depressive symptoms so the information was available and, as stated in the depression literature review section, the evidence of the depression's role in CVDs is as strong as for high-density lipoprotein cholesterol and therefore it seemed important to include it in our classification. Additionally, the Framingham general cardiovascular risk profile uses blood pressure clinical measures and our data do only include self-reported information of high blood pressure.

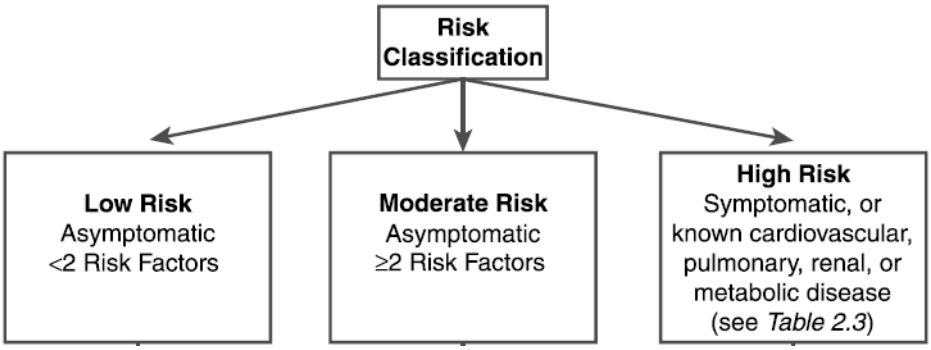
Another useful scale, the ASSIGN score from the Scottish Heart Health Extended Cohort,[123] informed the risk score used in this study. The AASIGN score adds social deprivation to classic biological risk factors, like blood pressure or high-density lipoprotein cholesterol, to calculate the cardiovascular risk. Adding a social perspective aligned very well with the overall scope of social disparities and prevention of this project. However, similarly with the Framingham it was based in blood pressure clinical measures, which were not available in our data.

Finally, the American College of Sports Medicine (ACSM) risk of cardiovascular event for exercise prescription[124] was the best match for both the data available and the

scope of this project. The ACSM risk of cardiovascular event for exercise prescription[124] is developed and used to evaluate individual's risk for adverse exercise-related cardiovascular events and it is part of the pre-participation health screening recommendations from the *ACSM's Guidelines for Exercise Testing and Prescription.*[125] ACSM risk classification aims to "identify individuals who may be at elevated risk for exercise-related sudden cardiac death and/or acute myocardial infarction" without disincentivizing the practice of physical activity.[126] This perspective aligned very well with the overall framework of prevention and interest in physical activity. Another strength of this risk classification is that patients can apply the algorithm themselves which makes it an affordable option for primary care where available resources are limited. ACSM risk classification is built taking into account the number of risk factors and the presence or history of cardiovascular disease (see Figure 1 and Table 2.1). In addition, ACSM risk classification is linked with the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) Stratification Algorithm for Risk of Event (see Figure 3).[127] Fortunately, AACVPR's stratification accounts for depressive symptoms and that solved another of our previous obstacles. For the AACVPR's stratification algorithm, the presence of depressive symptoms is considered sufficient for categorizing a patient at High risk of event (not specific solely to exercise events) AACVPR's stratification. The combination of both algorithms was made using the ACSM's risk classification structure and adding depressive symptoms as a risk factor to create the ROCE (Risk of Cardiovascular Event)[5].

[5] Additionally, a sensibility test was made in which depressive symptoms were not included in the risk classification but merely as a covariate.

Figure 1: ACSM risk of cardiovascular event for exercise prescription Algorithm



(Source: *Pescatello LS. ACSM Guidelines for Exercise Testing and Prescription, 9th Edition; 2014*)

In this study, ROCE is an ordinal categorical variable with three levels: low risk, moderate risk and high risk. The categorization was made using the number of cardiovascular risk factors and history of cardiovascular disease. Cardiovascular risk factors identified were: HBP, diabetes, abdominal obesity (waist circumference), depressive symptoms and smoking habits. Also, the presence or history of metabolic, pulmonary and cardiovascular diseases like diabetes, heart attack or myocardial infarction, any heart disease including angina or congestive heart failure and, and, stroke was taken into account. Respondents showing fewer than two risk factors were classified as low risk, those with two or more risk factors as moderate risk, and with the presence or history of diabetes or pulmonary diseases, explicitly emphysema, asthma, or chronic bronchitis and/or any cardiovascular diseases namely heart attack or myocardial infarction, any heart disease including angina or congestive heart failure and, stroke were classified as high risk. Table 2.1 shows the Defining criteria of the CVD Risk Factors in

the ACSM risk of cardiovascular event for exercise prescription's algorithm used for this study.

Figure 2: Defining criteria of the CVD risk factors in the ACSM risk of cardiovascular event for exercise prescription algorithm[6]

Variable	Description
Age	Men ≥45 yr; Women ≥55 yr
Family History	Myocardial infarction, coronary revascularization, or sudden death before 55 yr of age in father or other male first-degree relative, or before 65 yr of age in mother or other female first-degree relative
Cigarette smoking	Current cigarette smoker or those who quit within the previous 6 months or exposure to environmental tobacco smoke
Sedentary lifestyle	Not participating in at least 30 min of moderate intensity (40%–60% V.O2R) physical activity on at least three days of the week for at least three months
Obesity	Body mass index ≥30 kg/m2 or waist girth >102 cm (40 inches) for men and >88 cm (35 inches) for women
Hypertension	Systolic blood pressure ≥140 mm Hg and/or diastolic ≥90 mm Hg, confirmed by measurements on at least two separate occasions, or on antihypertensive medication
Dyslipidemia	Low-density lipoprotein (LDL-C) cholesterol ≥130 mg/dL (3.37 mmol·L-1) or high-density lipoprotein (HDL-C) cholesterol <40 mg/dL (1.04 mmol/L) or on lipid-lowering medication. If total serum cholesterol is all that is available use ≥200 mg/dL (5.18 mmol/L)
Prediabetes	Impaired fasting glucose (IFG) = fasting plasma glucose ≥100 mg/dL (5.50 mmol·L·1) but ≤126 mg/dL (6.93 mmol·L-1) or impaired glucose tolerance (IGT) = 2-hour values in oral glucose tolerance test (OGTT) ≥ 140 mg/dL (7.70 mmol/L) but < 200 mg/dL (11.00 mmol·L-1) confirmed by measurements on at least two separate occasions
NEGATIVE RISK FACTOR	
High-serum HDL cholesterol† DEFINING CRITERIA ≥ 60 mg/dL (1.55 mmol·L-1)	

Note: It is common to sum risk factors in making clinical judgments. If HDL is high, subtract one risk factor from the sum of positive risk factors, because high HDL decreases CVD risk.

Individual response variable and ROCE components

Information for the ROCE (HBP, diabetes, smoking habits, abdominal obesity and depressive symptoms) was collected in NHATS using the following questions:

[6] Source: Pescatello LS. ACSM Guidelines for Exercise Testing and Prescription, 9th Edition; 2014

1. HBP: “Please tell me if a doctor ever told you that {you/he/she} had high blood pressure or hypertension? ”. Response included Yes, No, I don’t know or refused.
2. Smoking habit: {Do you/Does SP} smoke cigarettes now? Response included Yes, No, I don’t know or refused.
3. Abdominal obesity: waist circumference (WC) was measured during the survey. Abdominal obesity cut points are WC>102 cm for males and WC>88 cm for females. Among those respondents flagged as having bulky clothes during the measurement, 10 cm were subtracted from the WC
4. Depressive symptoms were identified using Patient Health Questionnaire-2 (PHQ-2)[128]. PHQ-2 questions are: “Over the last month, how often have you: a) had little interest or pleasure in doing things; b) felt down, depressed, or hopeless.” Response categories are: not at all, several days, more than half the days, and nearly every day. Scores are calculated based on answers (0 = not at all; 1= several days; 2=more than half the days; 3=nearly every day). Total score ranges from 0 to 6. Respondents showing 3 or more points were considered to show depressive symptoms.

AACVPR Stratification Algorithm for Risk of Event [127]
Not specific solely to exercise events.
1. Patient is at **HIGH RISK** if ANY ONE OR MORE of the following factors are present:
- Left ventricular ejection fraction < 40%
- Survivor of cardiac arrest or sudden death
- Complex ventricular dysrhythmias (ventricular tachycardia, frequent [> 6/min] multiform PVCs) at rest or with exercise
- MI or cardiac surgery complicated by cardiogenic shock, CHF, and/or signs/symptoms of post-procedure ischemia
- Abnormal hemodynamics with exercise, especially flat or decreasing systolic blood pressure or chronotropic incompetence with increasing workload
- Significant silent ischemia (ST depression 2mm or greater without symptoms) with exercise or in recovery
- Signs/symptoms including angina pectoris, dizziness, lightheadedness or dyspnea at low levels of exercise (< 5.0 METs) or in recovery
- Maximal functional capacity less than 5.0 METs*
- Clinically significant depression or depressive symptoms

2. Patient is at **LOW RISK** if ALL of the following factors are present:
- Left ventricular ejection fraction > 50%
- No resting or exercise-induced complex dysrhythmias
- Uncomplicated MI, CABG, angioplasty, atherectomy, or stent: o Absence of CHF or signs/symptoms indicating post-event ischemia
- Normal hemodynamic and ECG responses with exercise and in recovery
- Asymptomatic with exercise or in recovery, including absence of angina
- Maximal functional capacity at least 7.0 METs*
- Absence of clinical depression or depressive symptoms

3. Patient is at **MODERATE RISK** if they meet neither High Risk nor Low Risk standards:
- Left ventricular ejection fraction = 40–50%
- Signs/symptoms including angina at "moderate" levels of exercise (60–75% of maximal functional capacity) or in recovery
- Mild to moderate silent ischemia (ST depression less than 2mm) with exercise or in recovery

*If measured functional capacity is not available, this variable can be excluded from the risk stratification process.

Figure 3 AACVPR Stratification Algorithm for Risk of Event

Finally, NHATS collects the history or presence of pulmonary and cardiovascular diseases with the following questions: "I will read a list of some diseases and conditions that a doctor may have said you have.

"Please tell me if a doctor ever told you that {you/he/she} had

- diabetes?
- lung disease, such as emphysema, asthma, or chronic bronchitis?
- a heart attack or myocardial infarction?
- any heart disease including angina or congestive heart failure?
- a stroke?"

Response included Yes, No, I don't know or refused.

The following table summarizes how the ROCE is categorized and its distribution in the sample:

Risk of cardiovascular event (ROCE)		**Community dwelling respondents (N, %)**
LOW	1≤ Risk Factors	1,964 (27.29%)
MODERATE	2≥ Risk Factors	1,365 (18.97%)
HIGH	Presence or history of diabetes, pulmonary disease or CVD	3,868 (53.74%)
	Total	7,197

2-5 Independent Variables:

Demographics Measures

Age: Categorical age includes 6 categories: 65-69, 70-74, 75-79, 80-84, 85-89, and, 90 or more years old.

Marital status: categorized in four categories as married or living with a partner, separated or divorced, widowed and, never married. The reference category was married

or living with a partner.

Social Risk Factors Measures:

Gender: there are just two options in the survey regarding gender, female (coded as 0) and male (coded as 1) and all participants are categorized in one of them. Other gender identity options were not allowed

Race/ethnicity: classified as non-Hispanic white (coded as 0), non-Hispanic black (coded as 1) and Hispanic (coded as 2). Participants not fitting the above categories were classified as "other" (coded as 3), including participants who reported multiple races.

Education: Respondents were asked about the highest level of education completed. Four categories contain the original nine from the survey:

1. Less than high school. Includes No schooling completed, 1st-8th grade and 9th-12th grade (no diploma). This is the reference category.
2. High school graduate (high school diploma or equivalent).
3. Some college. Includes Vocational, technical, business, or trade school certificate or Diploma (beyond high school level) and some college but no degree.
4. Bachelors or higher degree. Includes Associate's degree, Bachelor's degree and, Master's, professional, or doctoral degree.

Social Assistance recipient:

Social assistance receipt is a dichotomous variable based on any positive answer to five questions:

"There are several state and federal programs that help people in need. In the last year, did {you/SP} receive help from any of these programs?

a. Food stamps (also called the Supplemental Nutrition Assistance Program, or SNAP)?

b. Other food assistance such as Meals-on-Wheels?

c. Gas, electricity, or other energy assistance?"

d. "Is this home in Section 8 or public housing or housing for low-income seniors?"

e. "{Are you/Is SP} now covered by Medicaid?"

Respondents not receiving any type of social assistance were coded as 0 (reference category) and those answering yes to any or multiple of the previous questions were coded as 1.

Social Isolation: This variable is built based in the following question: "The next questions are about who you talk to about important things in your life. This may include good or bad things that happen to you, problems you are having, or important concerns you may have. Looking back over the last year, who are the people you talked with most often about important things?" If the answer is no one the person is considered isolated (coded as 1) and if there is at least one person the respondent is considered not isolated (coded as 0, reference category).

Perceived neighborhood social cohesion (PNSC): Perceived neighborhood social cohesion is adapted from the Project on Human Development in Chicago Neighborhoods[129]. Participants are asked three questions: if people in their community know each other well, are willing to help each other, and can be trusted. Answers could be: agree a lot, agree a little, or do not agree. This variable was constructed as a score. Responses were coded as 0 for agree a lot, 1 for agree a little and 2 for do not agree. Total score ranges from 0 to 6, being 6 the lowest social cohesion. The reference category of this variable is 0, the highest social cohesion and score 6 would be the lowest perceived social cohesion.

Additionally, Perceived Neighborhood Social Cohesion was used as a categorical variable (NSC_cat). The raw score was grouped as High PNSC for the reference category (scores 0 or 1), Moderate PNSC (scores 2 or 3) and Low PNSC (scores 4, 5 or 6).

Street maintenance: This variable is filled by the NHATS interviewer regarding the respondents' street conditions. "When standing in front of the SP's home/building, and looking around in every direction, how much of the following did you see?

a. Litter, broken glass, or trash, on sidewalks and streets?

b. Graffiti on buildings and walls?

c. Vacant or deserted houses or storefronts?"

Street maintenance is a dichotomous variable where answers were coded as 0 for none (reference category) and 1 for a little, some or a lot of litter, graffiti or vacant houses.

Health Status and Health Care Measures:

Number of comorbidities: This variable summarizes the number of comorbidities or chronic conditions collected by NHATS. Four categories are used: none, one comorbidity, two comorbidities, and three or more comorbidities. Respondents are asked if a doctor has ever said they had:

a. arthritis (including osteo or rheumatoid arthritis)
b. osteoporosis
c. dementia or Alzheimer's Disease
d. cancer
e. a broken or fractured hip (since age 50).

Functional status: Participants' functional status is measured assessing their Physical performance using the Short Physical Performance Battery (SPPB)[130]. SPPB is a score that sums the results of three standing balance tests (side by side, semi-tandem, and full-tandem), repeat chair stands (5 times) and walking speed on a 3-m course allowing walking aids but not wheelchair or scooter[119]. Scores range from 0 (not attempted) to 12 (best). The Functional status variable has four categories: minimal limitations, which is the reference category (scores from 10 to 12), mild limitations (scores from 7 to 9), moderate limitations (scores from 4 to 6) and, severe limitations (scores from 0 to 3).

Walking: this is a dichotomous variable that identifies if respondents have walked for exercise in the last month. Those answering no are coded as 0 (reference category) and yes are coded as 1.

Prescription drug insurance coverage: This is a dichotomous variable that reflects if participants were enrolled in Medicare part D or in any other prescription drug coverage (coded as 1) versus not (coded as 0 and reference category).

Type of Insurance: Since the NHATS sample is drawn from the Medicare beneficiaries this variable was built based on additional insurance. The four categories are: Just Medicare (reference category), Medigap, Medicaid and Tricare. This variable was used only in the descriptive analysis.

Regular source of care: This is a dichotomous variable and identifies if the respondent has a regular doctor for health care and health advice. Having a regular doctor was coded as 1 and not having one as 0 (reference category).

Visits to regular doctor last year: This is a dichotomous variable that asks if there was at least one visit to the regular doctor in the previous 12 months. Having a doctor

visit was coded as 1 and not having seen one in the last 12 months was coded 0 (reference category).

Hospital stay: This is a dichotomous variable that indicates if the person has been admitted in the hospital for at least one night in the last year. Any hospital admittance was coded as 1 and no admittance in the last year was coded as 0 (reference category).

2-6 Statistical Analysis

Data analyses were conducted using STATA 13.0 (Stata Corporation, College Station, TX). NHATS analytical sample weights account for differential probabilities of selection and adjust for potential bias related to unit nonresponse to obtain nationally representative estimates of the civilian, noninstitutionalized US population. NHATS sampling structure was taken into account when running the analysis (Stata code: svyset varunit [pweight = weighta], strata (varstrat)). The study was limited to community-dwelling respondents since the neighborhood social cohesion was a key variable in our study. However, that restriction was made using the subpopulation strategy in Stata so the standard errors of the estimates take into account the whole sample. The statistical analysis used to measure the bivariate associations between the risk of cardiovascular event and each covariate was Pearson's chi-square. Covariates were selected based on previous research and kept in the model independently of their significance. To calculate the adjusted odds ratios, an ordered logistic regression was used to examine the association between neighborhood social cohesion with the dependent variable Risk of Cardiovascular Event (ROCE) which had three levels, 0=low, 1= moderate and, 2=high. Initially an unadjusted model was fitted with each of the covariates.

Regarding social risk factors this study includes: gender, race, education, social assistance recipient, perceived neighborhood social cohesion and street disorder. Social assistance recipient, perceived neighborhood social cohesion and street disorder were examined with particular interest since they are potentially modifiable. Afterwards the remaining covariates were included in the adjusted model: age, marital status, social isolation, number of comorbidities, functional status, insurance type, prescription drug insurance coverage, regular source of care, visits to regular doctor last year and, hospital stay and walking practice in the last month. Adjusted odds ratios having a 95% confidence interval, not including one, were considered statistically significant. We explored possible effect modification by stratifying by gender, race and respondents with a proxy.

In the next section of this research, the nine components of the risk of cardiovascular event score (diabetes, HBP, obesity, tobacco use, depressive symptoms, heart disease, heart attack, stroke and lung disease) were analyzed. In this analysis, we created nine subsets of analysis exploring each of the ROCE components. A similar analysis strategy was followed in all of them. Initially a bivariate model was fitted using Pearson's chi-square. Covariates were selected from the literature review and were similar to the ROCE analysis model: age, gender, marital status, race, education social assistance recipient, social isolation and street disorder, street maintenance, number of comorbidities, functional status, insurance type, prescription drug insurance coverage, regular source of care, visits to regular doctor last year and, hospital stay and walking practice in the last month. After fitting a bivariate model for each covariate, an adjusted logistic regression was created to examine how social risk factors are associated

independently with the 9 components of the risk of cardiovascular event (ROCE) score (diabetes, HBP, obesity, tobacco use, depressive symptoms, heart disease, heart attack, stroke and lung disease).

CHAPTER 3: Results

3-1 Results Overview

The first section of this chapter will focus on the baseline characteristics of the community-dwelling Americans older than 65 years old, using data collected by NHATS in 2010. Table 1 and 2 present socio-demographic characteristics and potential cardiovascular social risk factors (perceived neighborhood social cohesion and street disorder). Table 3.0-3 shows the prevalence of each of the main medical cardiovascular risk factors (HBP, central obesity, diabetes, tobacco use), and prevalence of cardio-respiratory diseases (heart attack or myocardial infarction, any heart disease including angina or congestive heart failure, stroke and, any pulmonary diseases explicitly emphysema, asthma, or chronic bronchitis). Additionally, Table 3.0-4 and Table 3.0-5 examine the prevalence of risk factors for males and females by racial and ethnic groups.

In the second section of the results, Table 3.0-6 and Table 3.0-7 describe the characteristics of the respondents in each of the three levels of risk of cardiovascular event (ROCE). Ordered logistic regression models are used to measure the associations of the social risk factors with the risk of cardiovascular event unadjusted and adjusted (Table 3.0-8 and Figure 12).

Section three will delve into the individual associations of each of the 8 components of ROCE with the social risk factors, descriptively and using logistic regression models for associations.

3-2 NHATS Sample Baseline Characteristics

The NHATs sample is a nationally representative cohort of American older adults. The following figures and tables present the baseline characteristic regarding demographics, social status, health status, health care use and prevalence of major cardiovascular risk factors and cardio-respiratory diseases.

Figure 4: Demographics of American Older Adults

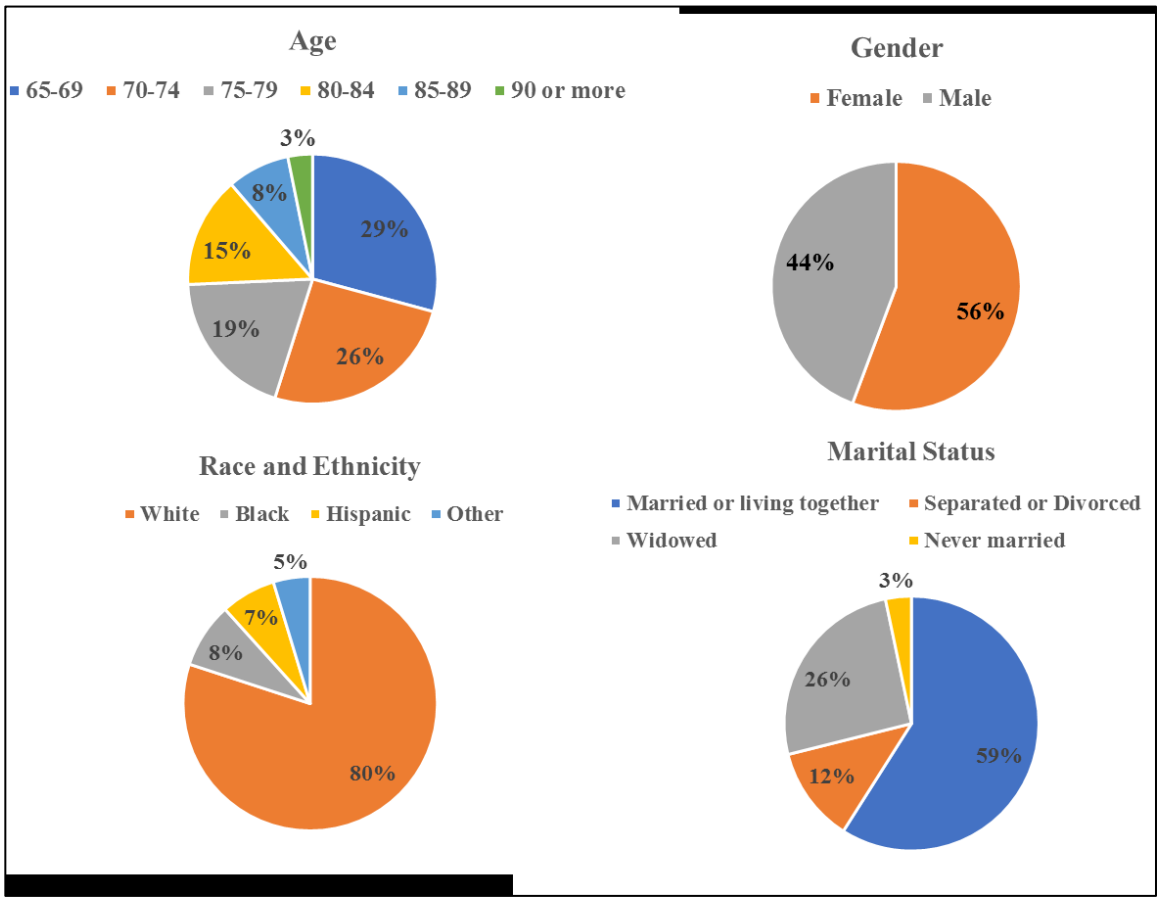


TABLE 3.0-1: DESCRIPTIVE CHARACTERISTICS OF AMERICANS 65 AND OLDER IN 2010

	Percentage	CI	N
Age (years)			**7,197**
65-69	29.2	[28.3 - 30.2]	1,392
70-74	25.7	[24.8 - 26.6]	1,541
75-79	19.4	[18.5 - 20.3]	1,461
80-84	14.4	[13.7 - 15.1]	1,422
85-89	8.1	[7.5 - 8.7]	859
90 or more	3.2	[2.9 - 3.6]	522
Sex			**7,197**
Female	55.7	[54.2 - 57.2]	4,147
Male	44.3	[42.8 - 45.8]	3,050
Race and Ethnicity			**7,197**
White	80.1	[78.2 - 81.8]	4,861
Black	8.3	[7.5 - 9.1]	1,598
Hispanic	7	[6.0 - 8.1]	445
Other	4.7	[3.7 - 5.9]	293
Marital Status			**7,190**
Married or living together	59	[57.6 - 60.4]	3,710
Separated or Divorced	12.1	[11.3 - 13.1]	874
Widowed	25.6	[24.3 - 26.8]	2,341
Never married	3.3	[2.8 - 3.9]	265
Highest Education Attained			**7,113**
Less than High school	21.9	[20.1 - 23.8]	1,947
High School	27.4	[26.1 - 28.8]	1,953
Some College	21.2	[20.0 - 22.5]	1,398
Bachelor or more	29.5	[27.2 - 31.9]	1,815
Isolated			**7,197**
No	94	[93.2 - 94.8]	6,719
Yes	6	[5.2 - 6.8]	478
Social Services Recipient			**7,106**
No	81.7	[80.3 - 83.1]	5,457
Yes	18.3	[16.9 - 19.7]	1,649
Perceived Neighborhood Social Cohesion			**7,148**
Score 0 (Highest)	30.2	[28.7 - 31.8]	2,127
Score 1	19.7	[18.7 - 20.8]	1,377
Score 2	18.4	[17.5 - 19.5]	1,329
Score 3 (Moderate)	16.5	[15.5 - 17.6]	1,189
Score 4	8	[7.3 - 8.9]	580
Score 5	4	[3.5 - 4.5]	300
Score 6 (Lowest)	3.1	[2.6 - 3.7]	246
Street disorder			
Presence of litter, graffiti and vacant houses			**7197**
No	94.3	[93.3 - 95.2]	6,655
Yes	5.7	[4.8 - 6.7]	542

TABLE 3.0-2. DESCRIPTIVE CHARACTERISTICS OF AMERICANS 65 AND OLDER IN 2010

	Percentage	CI	N
Number of comorbidities			**7,197**
No comorbidities	55.9	[54.5 - 57.2]	3,962
One comorbidities	35.1	[33.8 - 36.4]	2,521
Two comorbidities	8.1	[7.4 - 8.9]	629
Three or more comorbidities	0.9	[0.7 - 1.2]	85
Functional status			**6,239**
Minimal limitations	25.6	[24.0 - 27.1]	1,175
Mild Limitations	32.9	[31.4 - 34.5]	1,886
Moderate limitations	22.6	[21.3 - 23.9]	1,577
Severe limitations	18.9	[17.8 - 20.1]	1,601
Walked for exercise last month			**7,195**
No	38.7	[37.2 - 40.2]	3,053
Yes	61.3	[59.8 - 62.8]	4,142
Type of health insurance			**7,197**
Just Medicare	31.5	[29.7 - 33.2]	2,269
Medigap	51.6	[49.5 - 53.7]	3,478
Medicaid	11.1	[10.0 - 12.4]	1,055
Tricare	5.8	[4.7 - 7.1]	395
Has drug insurance			**7,052**
No	87.9	[86.6 - 89.1]	6,166
Yes	12.1	[10.9 - 13.4]	886
Has a regular source of care			**7,191**
No	4.8	[4.1 - 5.6]	356
Yes	95.2	[94.4 - 95.9]	6,835
Had a doctor visit in the last 12 months			**7,188**
No	6.9	[6.1 - 7.7]	454
Yes	93.1	[92.3 - 93.9]	6,734
Has been admitted in the hospital last 12 months			**7,189**
No	79.6	[78.3 - 80.9]	5,540
Yes	20.4	[19.1 - 21.7]	1,649

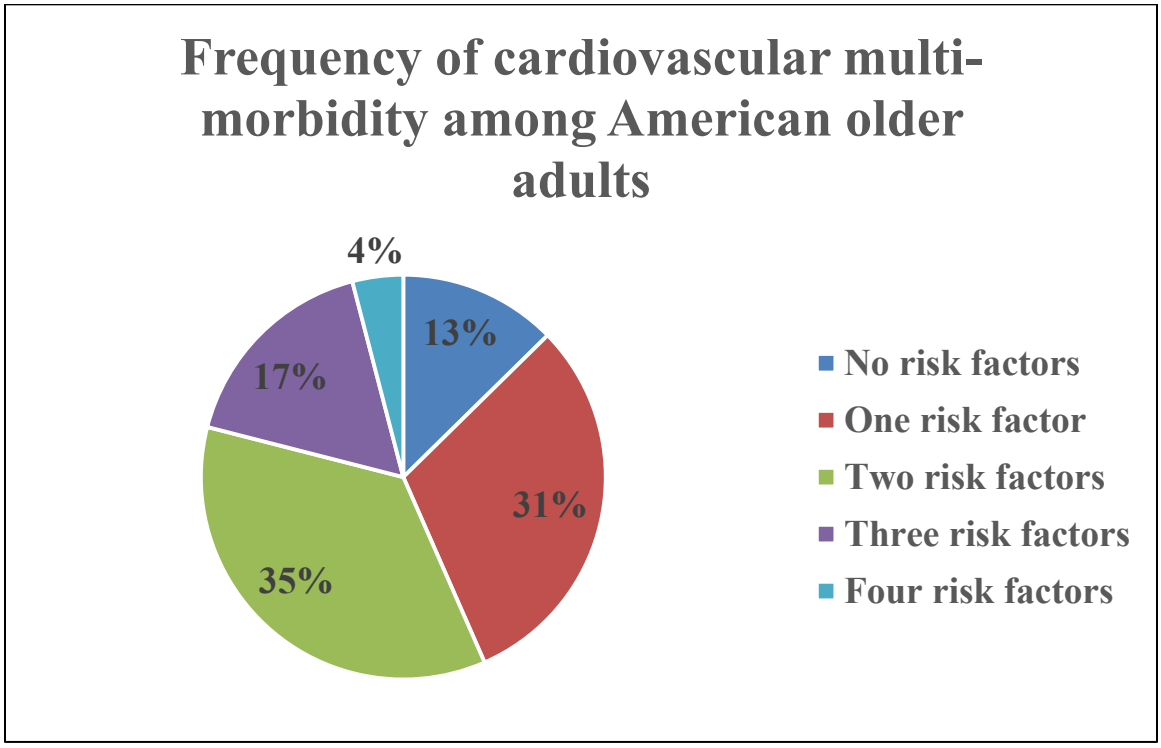
TABLE 3.0-3. PREVALENCE OF CARDIOVASCULAR RISK FACTORS AND CARDIO-RESPIRATORY DISEASES AMONG AMERICANS 65 AND OLDER IN 2010

	Percentage	CI	N
HBP			**7,190**
No	36.2	[34.8 - 37.5]	2,349
Yes	63.8	[62.5 - 65.2]	4,841
Central Obesity			**6,395**
No	34.2	[32.6 - 35.9]	2,155
Yes	65.8	[64.1 - 67.4]	4,240
Diabetes			**7,196**
No	76.4	[75.2 - 77.5]	5,378
Yes	23.6	[22.5 - 24.8]	1,818
Tobacco use			**7,190**
No	91.3	[90.4 - 92.2]	6,622
Yes	8.7	[7.8 - 9.6]	568
Depressive Symptoms			**7,193**
No	86	[84.6 - 87.2]	6,066
Yes	14	[12.8 - 15.4]	1,127
Heart attack			**7,192**
No	86.2	[85.2 - 87.2]	6,105
Yes	13.8	[12.8 - 14.8]	1,087
Stroke			**7,191**
No	90.4	[89.5 - 91.2]	6,368
Yes	9.6	[8.8 - 10.5]	823
Heart disease			**7,183**
No	82.7	[81.7 - 83.7]	5,855
Yes	17.3	[16.3 - 18.3]	1,328
Lung disease			**7,193**
No	84.6	[83.6 - 85.5]	6,095
Yes	15.4	[14.5 - 16.4]	1,098
Risk of cardiovascular event			**7,197**
Low	29.9	[28.4 - 31.4]	1,964
Intermediate	19.7	[18.6 - 20.8]	1.365
High	50.4	[48.8 - 52.1]	3,868

Distribution of Cardiovascular Risk Factors

Analyzing the distribution of cardiovascular risk factors among older American adults shows cardiovascular risk factors are present among the elderly. Only 13% of older Americans have no risk factors (HBP, Central obesity, Diabetes Tobacco use and Depressive Symptoms) while 66% have one or two cardiovascular risk factors.

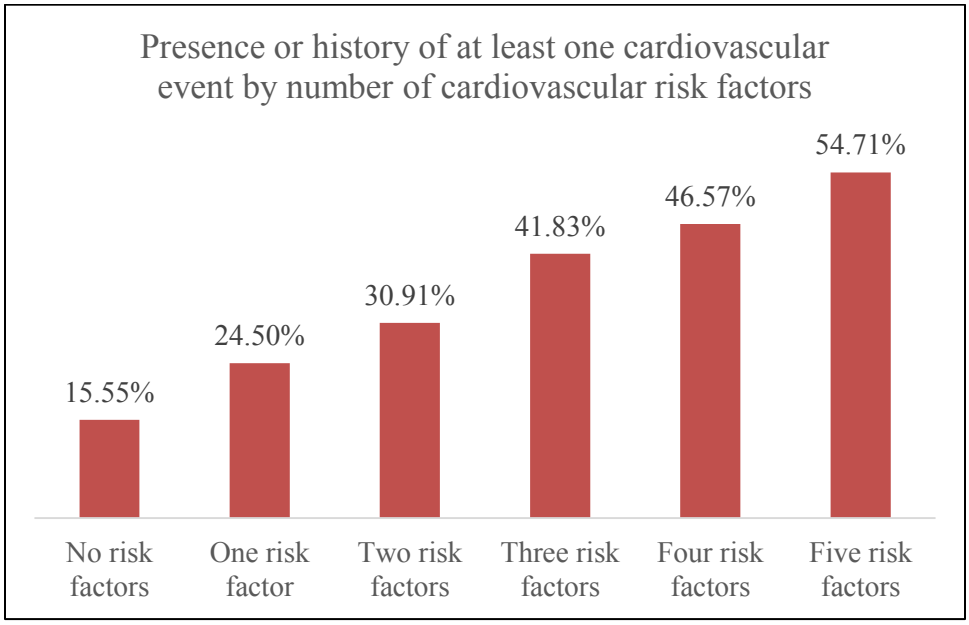
Figure 5. Frequency of cardiovascular multi-morbidity among American older adults



RESULTS SECTION 1: DESCRIPTIVE CHARACTERISTICS OF AMERICANS 65 AND OLDER IN 2010.

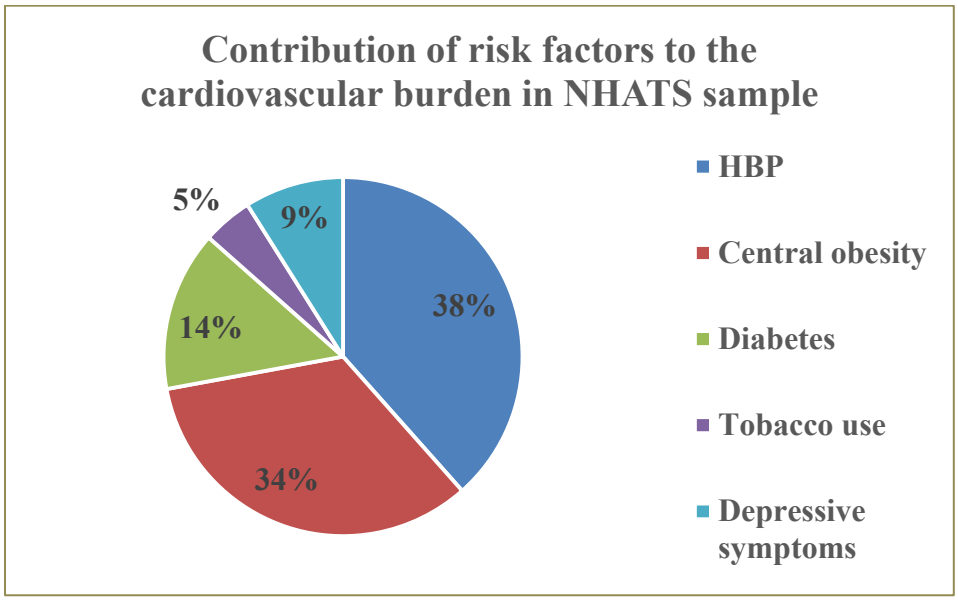
Looking more closely at the distribution of CVDs like heart attack, myocardial infarction, any heart disease, including angina or congestive heart failure, or stroke and the number of risk factors present, we find that as the number of risk factors increases the prevalence of CVDs increases, including current and past CVDs. Among older American adults without any risk factors, 15.55% report the presence or history of CVDs while those reporting five risk factors report a prevalence of 54.71% with CVDs.

Figure 6.Presence or history of at least one cardiovascular event by number of cardiovascular risk factors



The total number of risk factors present in our population is 12,594. Figure 7 shows the composition of the burden of risk factors. HBP and central obesity account for 72% of the total burden of disease, Diabetes for 14% and Depressive symptoms for 9 %. The least frequent risk factor is tobacco use which accounts for 5% of all cardiovascular risk factors.

Figure 7. Composition of cardiovascular risk factors burden in NHATS sample



Classic Risk Factors and Cardio-Respiratory Diseases Prevalence by Gender and Race

In Table 3.0-4, the NHATS population distribution of classic risk factors and prevalence of cardio-respiratory diseases is shown by gender and race. Gender and race disparities are present, with Black and Hispanic women the most affected from HBP, central obesity and diabetes among all groups. As expected, male's prevalence of heart attack and heart disease is higher than female's prevalence, except for stroke. Among females, racial differences are significant for HBP, central obesity, diabetes, depressive symptoms, tobacco use and heart disease. For males, race differences are significant for all categories except for tobacco use and depressive symptoms.

Figure 8.Gender differences in cardiovascular risk factors and cardio-respiratory diseases prevalence

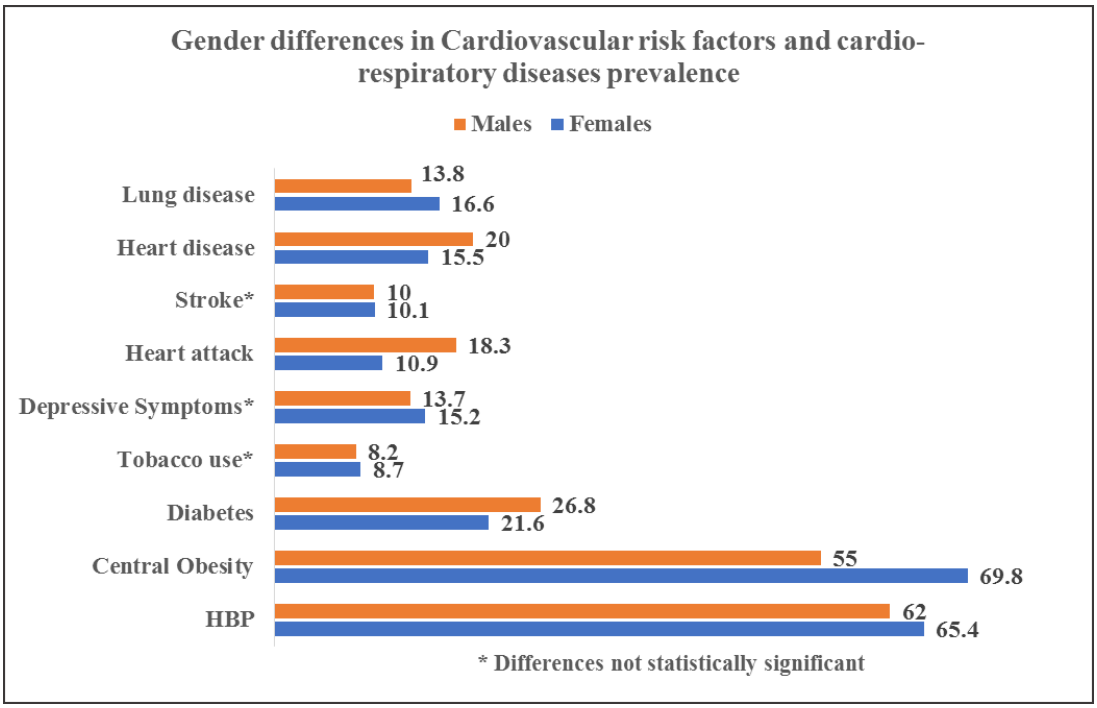


Figure 9.Cardiovascular risk factors and diseases prevalence by Racial and Ethnic group in females

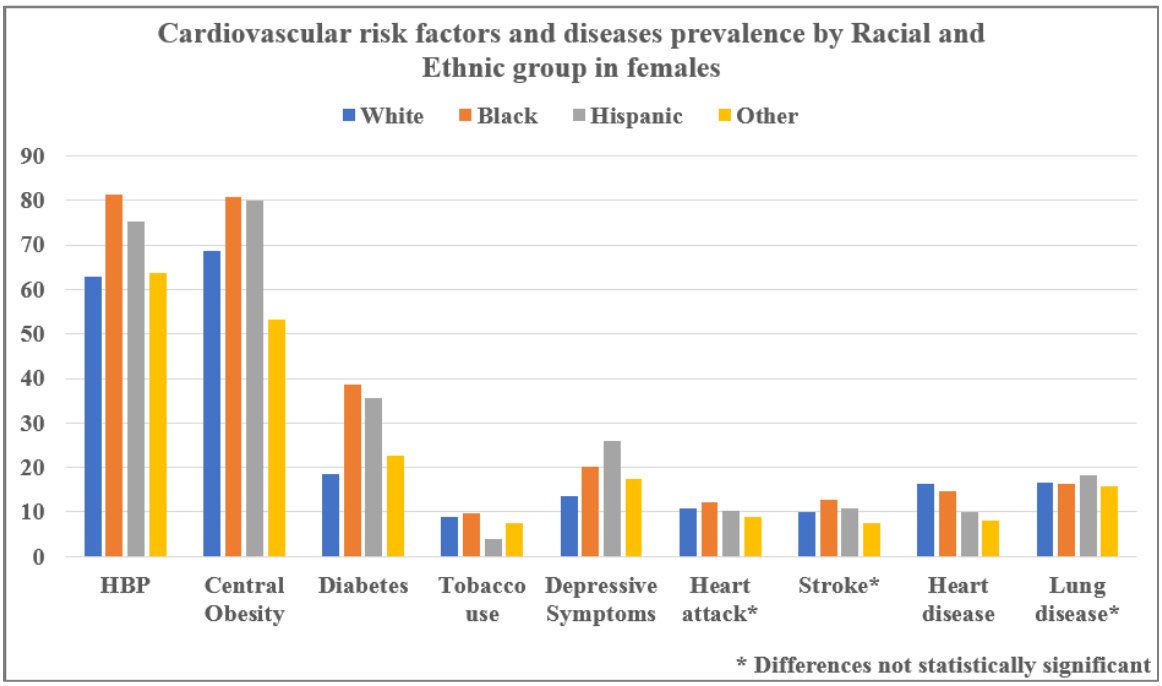


Figure 10. Cardiovascular risk factors and diseases prevalence by Racial and Ethnic group in males

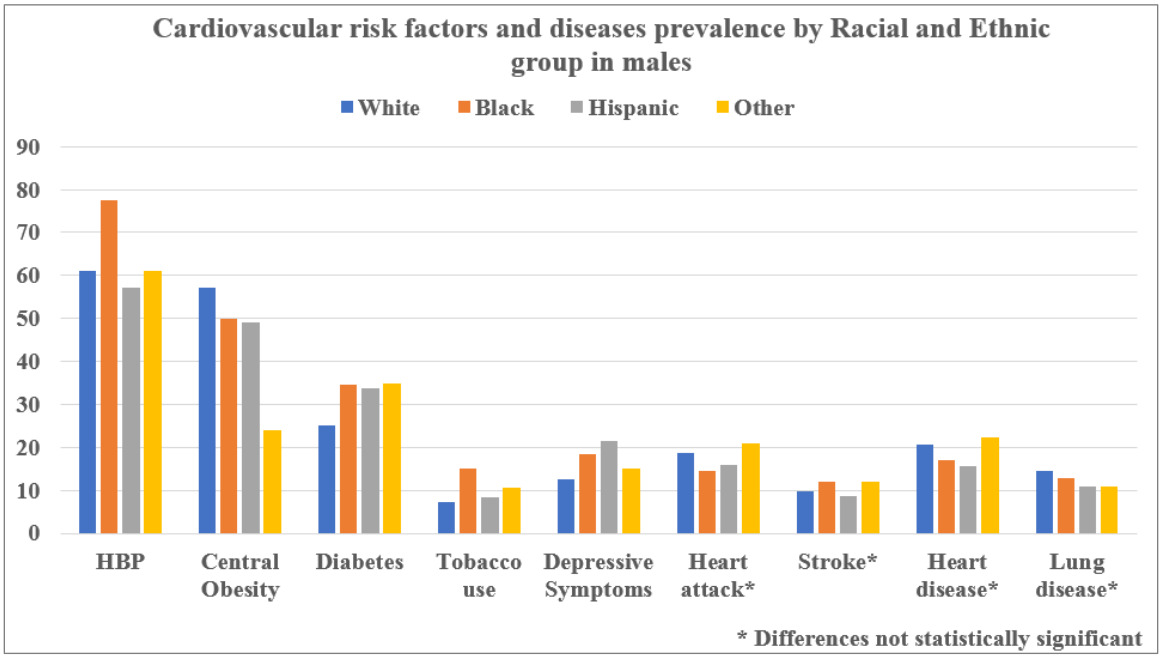


TABLE 3.0-4: PREVALENCE OF CLASSIC RISK FACTORS AND CARDIO-RESPIRATORY DISEASES BY GENDER AND RACE

	Females (%)						Males (%)						
						Within females test						Within males test	Gender diff test
	White	**Black**	**Hisp.**	**Other**	**Total**	**χ^2 p-value**	**White**	**Black**	**Hisp.**	**Other**	**Total**	**χ^2 p-value**	**χ^2 p-value**
HBP	62.9	81.4	75.4	63.8	65.4	0.000	61.1	77.4	57.1	61.2	62	0.000	0.012
Central Obesity	68.7	80.8	80	53.2	69.8	0.000	57.3	49.8	49.1	24.1	55	0.000	0.000
Diabetes	18.6	38.5	35.7	22.8	21.6	0.000	25	34.7	33.8	34.9	26.8	0.000	0.000
Tobacco use	9	9.6	3.8	7.4	8.7	0.050	7.4	15.2	8.4	10.7	8.2	0.000	0.531
Depressive Symptoms	13.6	20.2	26	17.5	15.2	0.000	12.5	18.3	21.6	15.2	13.7	0.002	0.169
Heart attack	10.9	12.3	10.3	8.9	10.9	0.595	18.7	14.5	16	20.8	18.3	0.270	0.000
Stroke	9.9	12.8	10.9	7.4	10.1	0.223	9.8	12	8.6	12	10	0.398	0.868
Heart disease	16.4	14.8	10	8.2	15.5	0.008	20.6	16.9	15.7	22.3	20	0.123	0.000
Lung disease	16.5	16.2	18.2	15.9	16.6	0.836	14.4	12.9	10.8	10.9	13.8	0.242	0.006

Social Risk Factor Prevalence by Gender and Race

Table 3.0-5 provides prevalence estimates for five social risk factors and the distribution of the risk factors by race and gender. The risk factor categories are education, marital status, receipt of social services, and responses to survey questions on perceived neighborhood cohesion and street disorder in their neighborhood. Regarding education, females are less likely to complete higher education than males (23% of females attain Bachelor or more vs. 36.3 % of males). This gender disparity is also present regarding receiving social assistance, 20.7% of females receive some type of assistance (food stamps, gas or energy assistance, section 8 housing) while 15.7% of males receive some assistance. Regarding racial and ethnic inequalities, black, Hispanic and other minority ethnic groups, show the highest percentages receiving social assistance (around 40%) as compared to whites (around 12.5%). Racial disparities in neighborhood characteristics including perceived social cohesion and street disorder follow a similar pattern, around 30% of Hispanics and 20% of blacks report low social cohesion. Street disorder, namely the presence of litter, graffiti and vacant houses in the neighborhoods reported by the NHATS interviewer, is more frequent for Black respondents (19.8% in females and 19.4% in males).

TABLE 3.0-5: PREVALENCE OF SOCIAL RISK FACTORS BY GENDER AND RACE

	Females					Males				
	White	**Black**	**Hispanic**	**Other**	**Total**	**White**	**Black**	**Hispanic**	**Other**	**Total**
Highest Education Attained										
Less than High School	16.3	38.4	59.4	32.4	21.7	16.8	40.8	59.5	27.4	21.9
High School	33.1	25.6	17.9	20.4	30.9	24	24.6	16	18.3	23.3
Some College	25.2	18.6	14.4	18.8	23.6	20.1	13.6	9.3	8.7	18.5
Bachelor or more	25.5	17.3	8.3	28.4	23.8	39.1	21.1	15.2	45.6	36.3
Marital Status										
Married or living together	45.9	22.8	39.7	46.9	43.5	76.1	62.1	69.9	73.7	74.5
Separated or Divorced	12.4	22.4	19.4	17.6	14	8.5	19.3	14.1	15.9	10
Widowed	38.2	47.1	35.8	32.9	38.6	12.2	12.7	11.9	8.2	12
Never married	3.5	7.7	5.1	2.6	3.9	3.3	5.9	4.1	2.2	3.5
Social Services recipient	15.1	45.3	45	40.6	20.7	10.7	33.8	43.2	38.4	15.7
Perceived Neighborhood Social Cohesion										
High PNSC	54.7	43.8	32.4	39	51.5	51.5	41	38.5	43.1	49.5
Moderate PNSC	32.7	36.3	39.1	43.5	34	34.4	39.9	35	42	35.2
Low PNSC	12.6	19.9	28.5	17.5	14.5	14.1	19.2	26.4	14.9	15.3
Street disorder										
Presence of litter, graffiti and vacant houses	7	19.8	14.1	13.6	8.9	5.4	19.4	17.1	12.6	7.6

χ^2 test for all intra and inter group differences $p < 0.001$

3-3 ROCE Group Baseline Characteristics

Among the three risk levels - low, moderate and high risk of cardiovascular event (ROCE) – there were statistically significant differences ($p < 0.001$) within all the categories examined.

Generally speaking, participants with better social and health profiles tended to group more frequently into low risk groups when compared with disadvantaged participants. These differences were clearer between low and high ROCE while, in the moderate risk group, those differences were less evident (see Table 3.0-6 and 7). For example, in terms of education there was an increasing gradient of belonging to low risk group as education increased; among people with less than high school, 21.9% are grouped as low ROCE compared with 29.7% of participants with a bachelor's degree or more education. Indeed, there was an education gradient in the low risk group, as education increased more people were classified as low ROCE. A similar trend was observed in the high ROCE group, but in the opposite direction: 43% of participants with the highest education attainment were classified as high risk, while this rose to 59.1% among people with the lowest level of education.

Regarding perceived neighborhood social cohesion, there was also a gradient (shown in Figure 11), where respondents reporting lower levels of social cohesion were more frequently classified as high risk group (64.8%) than participants reporting the highest level of social cohesion (47.3%). Looking at neighborhood characteristics, there were differences in ROCE grouping if respondents lived in a neighborhood with any presence of litter, graffiti and vacant houses (determined by the interviewer). In fact, 59.9% of those living in neighborhoods marked with street disorder were grouped into high ROCE, 16.1% in moderate risk and 24% in low risk, and, among

those living in areas with no street disorder, 49.9% belong to high ROCE, 19.9% to moderate and 30.2% to low ROCE.

Taking into account health status and health care characteristics, respondents reporting no physical limitations, no comorbidities, no doctor visits or hospital admissions in the last 12 months, tended to fall into low ROCE. Conversely, participants with more than three comorbidities, moderate and severe limitations, and with any doctor visit or hospital admissions in the last 12 months, tended to group into the high ROCE level.

Figure 11 Perceived Neighborhood Social Cohesion by ROCE

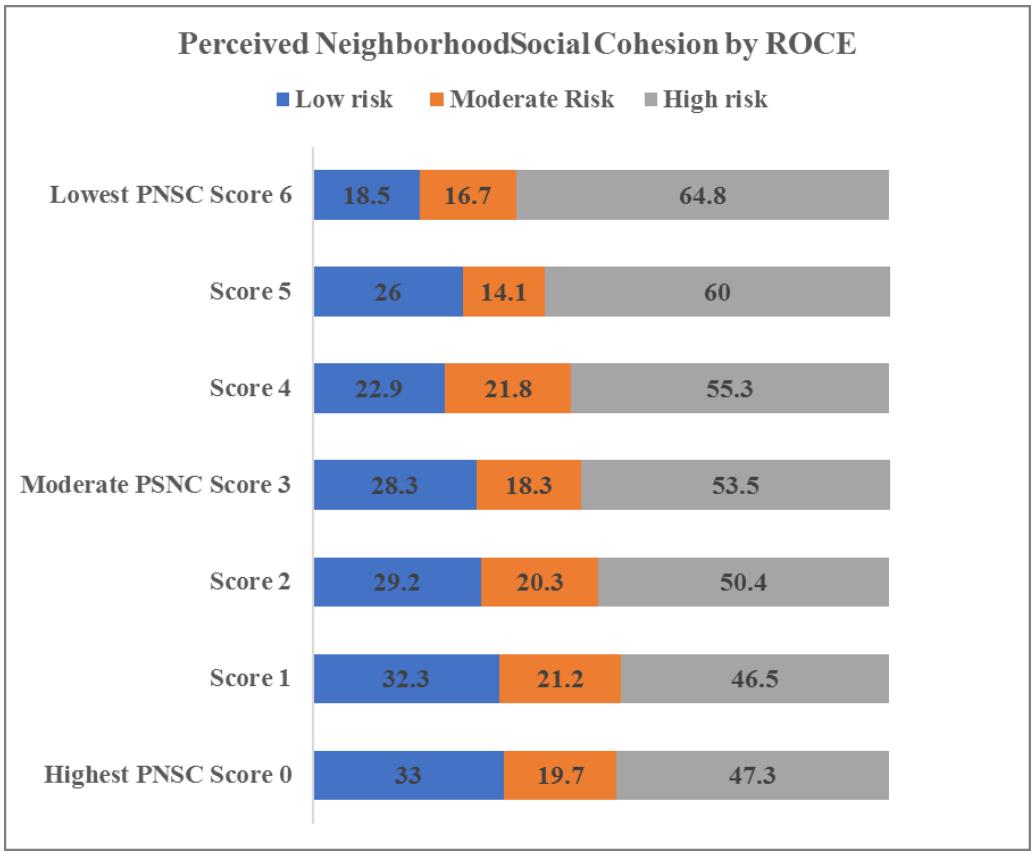


TABLE 3.0-6: BASELINE CHARACTERISTICS OF RISK OF CARDIOVASCULAR EVENT (ROCE) GROUPS BY SOCIAL RISK FACTORS

	LOW ROCE		MODERATE ROCE		HIGH ROCE	
	%	CI 95%	%	CI 95%	%	CI 95%
Sex						
Female	29.7	[27.9 - 31.5]	22.4	[20.7 - 24.2]	47.9	[45.9 - 50.0]
Male	30.2	[28.3 - 32.2]	16.3	[14.6 - 18.0]	53.5	[51.4 - 55.6]
Race and ethnicity						
White	30.6	[29.0 - 32.3]	20.1	[18.9 - 21.3]	49.3	[47.5 - 51.1]
Black	19.8	[17.8 - 21.9]	20.1	[17.8 - 22.7]	60.1	[57.1 - 63.1]
Hispanic	24.1	[18.8 - 30.4]	21.1	[17.5 - 25.1]	54.8	[48.8 - 60.7]
Other	43.8	[38.1 - 49.7]	10	[6.7 - 14.8]	46.1	[40.3 - 52.0]
Highest Education Attained						
Less than High school	21.9	[19.4 - 24.8]	19	[17.0 - 21.2]	59.1	[55.9 - 62.2]
High School	28.2	[26.1 - 30.4]	20.4	[18.3 - 22.6]	51.5	[48.6 - 54.3]
Some College	29.7	[26.7 - 33.0]	19.6	[17.5 - 21.8]	50.7	[47.4 - 54.1]
Bachelor or more	36.7	[33.8 - 39.8]	20.2	[18.5 - 22.0]	43.1	[40.1 - 46.2]
Social services recipient						
No	31.6	[29.9 - 33.3]	20.4	[19.2 - 21.6]	48	[46.1 - 49.9]
Yes	21.1	[18.3 - 24.1]	17.5	[15.5 - 19.6]	61.5	[58.4 - 64.5]
Perceived neighborhood social cohesion						
Score 0 (Highest PNSC)	33	[30.5 - 35.7]	19.7	[17.6 - 22.0]	47.3	[44.2 - 50.3]
Score 1	32.3	[29.3 - 35.4]	21.2	[18.7 - 24.0]	46.5	[43.0 - 49.9]
Score 2	29.2	[26.1 - 32.6]	20.3	[17.9 - 23.0]	50.4	[47.1 - 53.8]
Score 3 (Moderate PNSC)	28.3	[25.2 - 31.5]	18.3	[16.0 - 20.8]	53.5	[50.3 - 56.6]
Score 4	22.9	[18.8 - 27.7]	21.8	[17.8 - 26.4]	55.3	[50.4 - 60.0]
Score 5	26	[20.4 - 32.3]	14.1	[9.7 - 20.0]	60	[53.3 - 66.3]
Score 6 (Lowest PNSC)	18.5	[13.4 - 25.0]	16.7	[11.8 - 23.0]	64.8	[57.5 - 71.5]
Street Disorder						
No	30.2	[28.7 - 31.8]	19.9	[18.8 - 21.1]	49.9	[48.2 - 51.5]
Yes	24	[20.0 - 28.6]	16.1	[12.5 - 20.5]	59.9	[55.4 - 64.2]
Walked for exercise last month						
No	22.4	[20.6.24.2]	19.7	[18.1.21.4]	57.9	[56.0.59.8]
Yes	34.6	[32.7.36.6]	19.7	[18.2.21.2]	45.7	[43.7.47.7]

All variables show χ^2 p-value<0.001 for intragroup differences

TABLE 3.0-7. BASELINE CHARACTERISTICS OF RISK OF CARDIOVASCULAR EVENT (ROCE) GROUPS (II)

	LOW ROCE		MODERATE ROCE		HIGH ROCE	
	%	CI 95%	%	CI 95%	%	CI 95%
Marital Status						
Married or living together	33.1	[31.1 - 35.1]	19.2	[17.9 - 20.6]	47.7	[45.5 - 49.9]
Separated or Divorced	26. 6	[23.1 - 30.3]	21.7	[18.8 - 24.9]	51.8	[48.1 - 55.4]
Widowed	24.2	[21.7 - 26.8]	19.3	[17.5 - 21.3]	56.5	[53.8 - 59.3]
Never married	28.7	[22.9 - 35.2]	24.2	[18.0 - 31.7]	47.2	[40.6 - 53.8]
Isolated						
No	29.4	[27.8 - 31.0]	20.2	[19.0 - 21.4]	50.5	[48.7 - 52.2]
Yes	37.9	[32.0 - 44.2]	12.2	[9.5 - 15.5]	49.9	[43.3 - 56.5]
Comorbidities						
No comorbidities	32.5	[30.8 - 34.3]	20.5	[18.9 - 22.3]	46.9	[45.1 - 48.8]
One comorbidities	27.2	[24.9 - 29.6]	18.7	[17.1 - 20.4]	54.2	[51.6 - 56.6]
Two comorbidities	26	[22.4 - 29.9]	16.9	[13.8 - 20.6]	57.1	[52.6 - 61.4]
Three or more comorbidities	10.2	[5.3 - 18.7]	29.4	[18.9 - 42.8]	60.4	[47.2 - 72.3]
Functional status						
Minimal limitations	46.8	[43.5 - 50.2]	19	[16.9 - 21.2]	34.2	[30.7 - 38.0]
Mild limitations	31.8	[29.2 - 34.5]	23.9	[21.7 - 26.4]	44.3	[41.9 - 46.6]
Moderate limitations	18.8	[16.6 - 21.2]	22.6	[20.3 - 25.1]	58.5	[55.9 - 61.1]
Severe limitations	17.9	[15.7 - 20.3]	13.3	[11.6 - 15.1]	68.8	[66.1 - 71.5]
Type of health insurance						
Just Medicare	33.1	[30.7 - 35.5]	19.8	[17.9 - 21.8]	47.2	[44.8 - 49.6]
Medigap	30	[28.1 - 31.9]	20.5	[18.9 - 22.3]	49.5	[47.2 - 51.8]
Medicaid	20.5	[17.8 - 23.5]	16.4	[14.1 - 18.9]	63.2	[59.5 - 66.7]
Tricare	30	[25.3 - 35.1]	18	[13.7 - 23.3]	52	[46.3 - 57.8]
Has drug insurance						
No	28.4	[26.8 - 30.1]	19.7	[18.5 - 21.0]	51.9	[49.9 - 53.8]
Yes	38.3	[34.5 - 42.4]	21.3	[18.2 - 24.7]	40.4	[36.8 - 44.1]
Has a regular source of care						
No	48.6	[43.2 - 54.0]	16.7	[13.0 - 21.3]	34.7	[30.2 - 39.6]
Yes	28.9	[27.4 - 30.5]	19.9	[18.7 - 21.0]	51.2	[49.5 - 53.0]
Had a doctor visit in the last 12 months						
No	56	[50.0 - 61.8]	16.4	[12.8 - 20.7]	27.6	[23.3 - 32.4]
Yes	27.9	[26.5 - 29.4]	20	[18.8 - 21.2]	52.1	[50.4 - 53.8]
Has been admitted in the hospital last 12 months						
No	33.1	[31.5 - 34.7]	21.2	[19.8 - 22.6]	45.7	[44.1 - 47.4]
Yes	17.4	[15.2 - 19.8]	14	[12.1 - 16.1]	68.7	[66.1 - 71.1]

All variables show χ^2 p-value<0.001 for intragroup differences

Ordered Logistic Regression Models

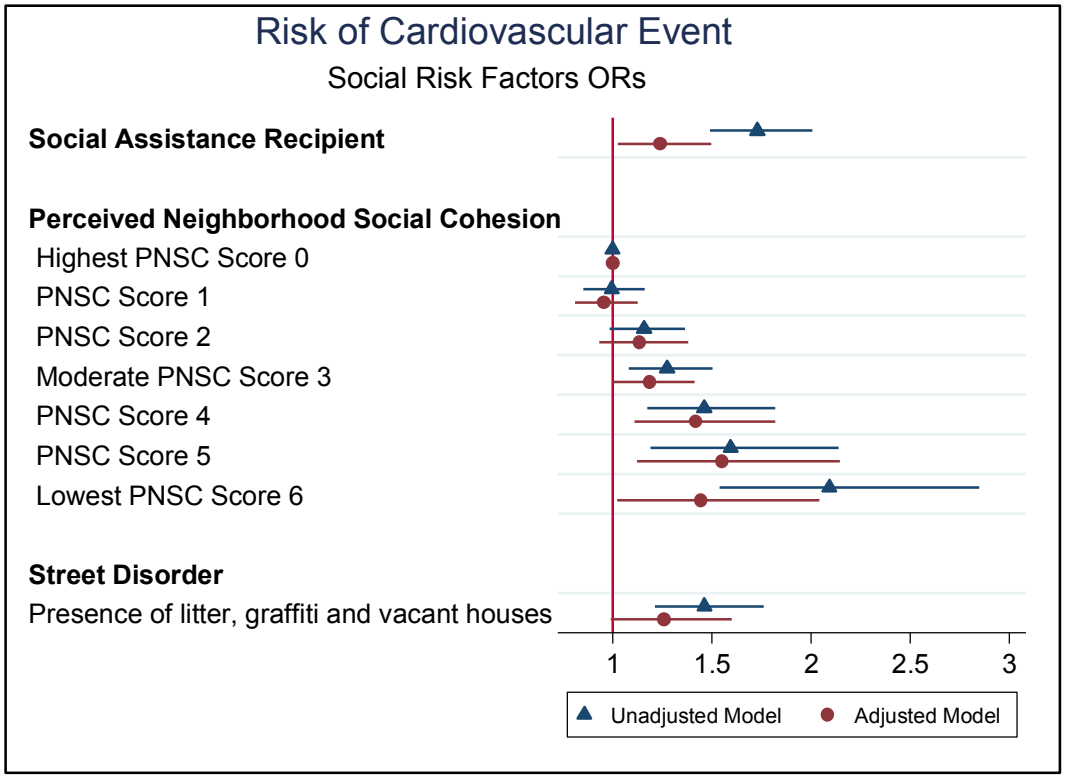
The final ordered logistic regression model (Table 3.0-8) for ROCE included age, sex, marital status, education, race, being recipient of social assistance, perceived neighborhood social cohesion, street disorder, walked for exercise in the last month, SPPB score for physical limitations, number of comorbidities prescription drug insurance, regular source of care, any doctor visits in the last 12 months, and any hospital stay in the last 12 months. After adjusting for sociodemographic factors, baseline health status and healthcare utilization, low perceived neighborhood social cohesion (PNSC) and street disorder were associated with higher likelihood of belonging to high ROCE groups. PNSC was categorized in 7 levels: from lowest (score 6) to highest PNSC (score 0) which was the reference category. The odds of having higher ROCE was associated with a lower perceived neighborhood social cohesion both in the unadjusted and adjusted models. In the adjusted models, odds ratios of having a higher ROCE increased for each downward step in perceived neighborhood social cohesion in a nearly perfect line. Figure 12 illustrates these associations. When compared with the highest or "perfect" neighborhood social cohesion, the lowest score (6), is associated with 44% increased odds of belonging to the high-risk group of ROCE (CI 1.02 - 2.04 p= 0.037), score 5 is associated with 55 % increase (CI 1.12-2.14 p=0.009), score 4 is associated with 42% increased odds (CI 1.10-1.81 p= 0.006), score 3 is associated with 18% increase (.99-1.41 p=0.052), scores 2 with 13% increase (CI .93-1.37 p=0.198) and, finally score 1 showed no increase (OR=0.95 CI .80-1.12 p= 0.571).

Additionally, being a recipient of social assistance was associated with augmented risk of belonging to ROCE high-risk group showing an OR 1.23 (CI 1.02-

1.49 p= 0.028). Regarding street disorder, the presence of litter, graffiti or vacant houses in the neighborhood was associated with 25% (CI 0.98-1.59 p=0.061) increase in belonging to a high-risk group of ROCE.

Figure 11 displays the unadjusted and adjusted association of ROCE with being a recipient of social assistance, neighborhood social cohesion and street disorder.

*Figure 12. Association between ROCE and Social Risk Factors, Unadjusted and Adjusted Model**



*Model adjusted for: age, sex, marital status, education, race, walked for exercise in the last month, social isolation, SPPB score for physical limitations, number of comorbidities, prescription drug insurance, regular source of care, any doctor visits in the last 12 months, and, any hospital stay in the last 12 months.

TABLE 3.0-8: FULL UNADJUSTED AND ADJUSTED ORDERED LOGISTIC REGRESSION MODELS FOR ROCE

	MODEL 1[a]		MODEL 2[b]	
	OR	**IC 95%**	**OR**	**IC 95%**
Gender (Male)	1.14***	[1.05 - 1.24]	1.55***	[1.36 - 1.77]
Race and Ethnicity				
White	1		1	
Black	1.61***	[1.42 - 1.82]	1.17**	[1.02 - 1.34]
Hispanic	1.29*	[1.00 - 1.67]	0.86	[0.65 - 1.14]
Other	0.71***	[0.55 - 0.91]	0.74*	[0.52 - 1.05]
Education Status				
Less than High School	1		1	
High School	0.73***	[0.62 - 0.86]	0.89	[0.75 - 1.06]
Some College	0.70***	[0.59 - 0.83]	0.98	[0.80 - 1.20]
Bachelor or more	0.51***	[0.43 - 0.60]	0.83*	[0.67 - 1.02]
Marital Status				
Married or living together	1		1	
Separated or Divorced	1.24**	[1.05 - 1.48]	1.17	[0.97 - 1.42]
Widowed	1.47***	[1.29 - 1.67]	1.30***	[1.09 - 1.55]
Never married	1.07	[0.85 - 1.35]	0.86	[0.67 - 1.11]
Social services recipient	1.73***	[1.49 - 2.01]	1.21**	[1.01 - 1.46]
Perceived Neighborhood Social Cohesion				
Score 0 (Highest PNSC)	1		1	
Score 1	0.99	(0.85 - 1.16]	0.96	(0.81 - 1.13)
Score 2	1.16*	(0.98 - 1.36]	1.14	(0.94 - 1.39)
Score 3 (Moderate PNSC)	1.27***	(1.08 - 1.50]	1.20**	(1.01 - 1.42)
Score 4	1.46***	(1.17 - 1.82]	1.43***	(1.12 - 1.83)
Score 5	1.60***	(1.19 - 2.14]	1.55***	(1.12 - 2.14)
Score 6 (Lowest PNSC)	2.09***	(1.54 - 2.85]	1.45**	(1.03 - 2.05)
Street Disorder [c]	1.46***	[1.21 - 1.76]	1.24*	[0.98 - 1.56]
Walked for exercise last month	0.59***	[0.54 - 0.64]	0.78***	[0.70 - 0.86]
Functional status				
No limitations	1		1	
Mild limitations	1.71***	[1.45 - 2.01]	1.65***	[1.40 - 1.95)
Moderate limitations	3.09***	[2.68 - 3.56]	2.73***	[2.34 - 3.19)
Severe limitations	4.43***	[3.71 - 5.29]	3.49***	[2.87 - 4.25)
Number of comorbidities				
No comorbidities	1		1	
One comorbidity	1.32***	[1.19 - 1.47]	1.17***	[1.04 - 1.32]
Two comorbidities	1.46***	[1.23 - 1.74]	1.27**	[1.06 - 1.51]
Three or more comorbidities	2.04***	[1.34 - 3.09]	1.09	[0.70 - 1.68]
Isolated (no one to talk to)	0.84	[0.63 - 1.12]	0.74*	[0.52 - 1.05]
Has drug insurance	0.63***	[0.54 - 0.75]	0.63***	[0.52 - 0.77]
Has a regular source of care	2.17***	[1.75 - 2.69]	1.52***	[1.13 - 2.06]
Had a doctor visit in the last 12 months	3.13***	[2.48 - 3.95]	2.34***	[1.68 - 3.24]
Has been admitted in the hospital last 12 months	2.54***	[2.26 - 2.86]	1.87***	[1.64 - 2.14]

*** ***p<0.01***; ** ***p<0.05***; * ***p<0.1***

[a] Model without adjustment of variables

[b] Model adjusted for age

[c] Presence of litter, graffiti and vacant houses

3-4 Neighborhood Social Cohesion and ROCE

In this section we will look individually at each of the eight components of the cardiovascular risk score. Results will describe the characteristics of the population according to each component. Additionally, regression models measuring the association of social risk factors and each ROCE component will be shown. To facilitate the presentation, we will first look at each of the risk factors and then at the cardiovascular and respiratory diseases.

Prevalence CVD Risk Factors by Population Baseline Characteristics

Figure 12 shows risk factors prevalence was significantly different depending on respondent's education level. Highest education participants have lower prevalence of risk factors.

Figure 13.Prevalence of cardiovascular Risk Factors by Education level

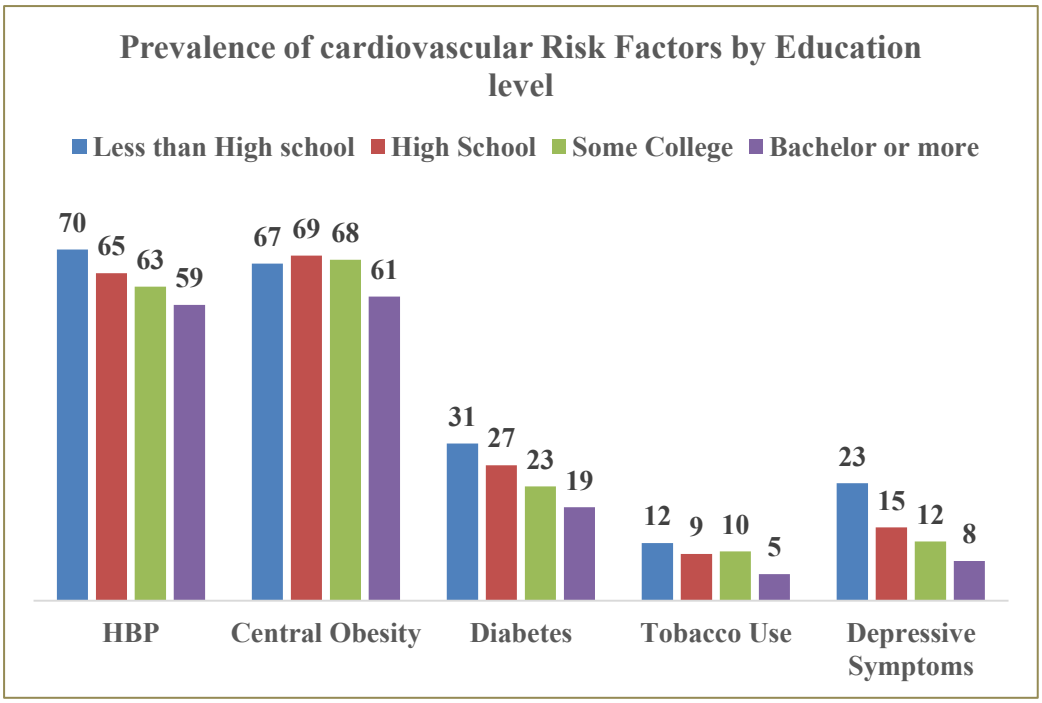
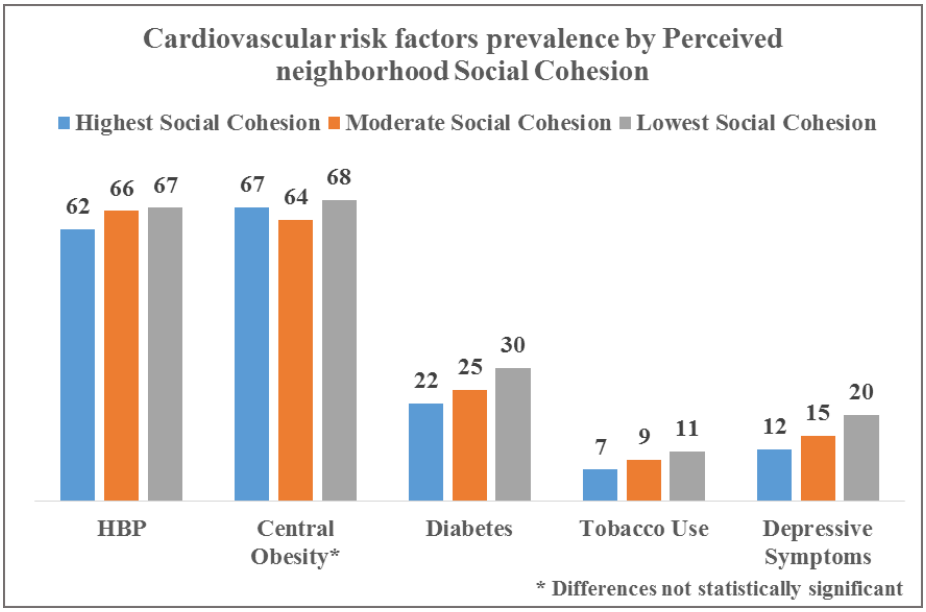


Figure 13 portrays differences in risk factor prevalence according to perceived neighborhood social cohesion level. Except for central obesity, all differences are statistically significant. Graphs depict how prevalence of cardiovascular risk factors increases as perceived social cohesion decreases.

Figure 14.Cardiovascular risk factors prevalence by Perceived Neighborhood Social Cohesion



Regarding social characteristics, receiving social assistance is also statistically associated with increased prevalence of all risk factors and cardiovascular and respiratory conditions.

Figure 15. Prevalence of cardiovascular risk factors by social assistance recipient status

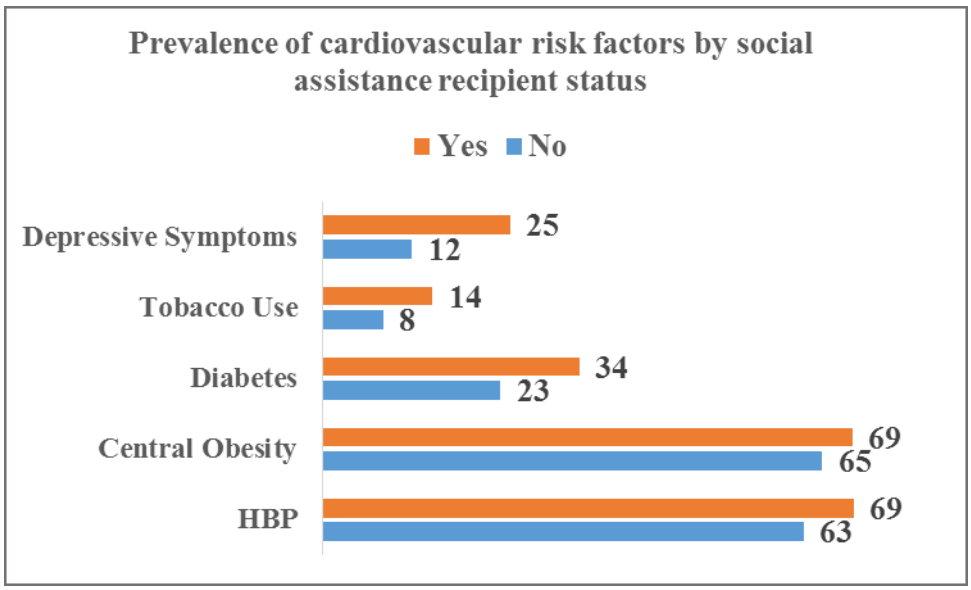


TABLE 3.0-9: PREVALENCE OF RISK FACTORS BY DESCRIPTIVE CHARACTERISTICS OF AMERICAN OLDER ADULTS (I)

	HBP		CENTRAL OBESITY		DIABETES		TOBACCO USE		DEPRESSIVE SYMPTOMS	
	%	CI 95%	%	CI 95%	%	CI 95%	%	CI 95%	%	CI 95%
Age (years)										
65 – 69	57.1	[54.2-60.0]	65.4	[62.3-68.3]	23.9	[22.4-25.6]	11.7	[10.1-13.4]	13.1	[11.3-15.2]
70 – 74	64.4	[62.1-66.7]	67.8	[65.0-70.5]	26.5	[24.8-28.3]	10.6	[9.2-12.2]	13	[11.1-15.2]
75 – 79	68.5	[65.6-71.3]	66.5	[63.3-69.5]	26.3	[24.3-28.3]	6.9	[5.7-8.3]	13.9	[12.1-16.0]
80 – 84	67.7	[65.1-70.3]	64.8	[62.2-67.4]	23.4	[21.7-25.2]	4.3	[3.5-5.4]	15.2	[13.4-17.2]
85 – 89	69	[65.4-72.4]	60.8	[55.8-65.5]	20.9	[18.6-23.5]	1.2	[0.8-1.9]	17.9	[15.3-20.8]
More than 90	61.8	[57.7-65.8]	63.6	[58.2-68.6]	14.8	[12.2-17.8]	1.5	[0.9-2.6]	16.1	[13.0-19.8]
Sex										
Female	65.4	[63.6-67.1]	72.6	[70.6-74.5]	22	[20.7-23.4]	8.8	[7.8-9.9]	14.7	[13.0-16.6]
Male	61.9	[59.8-64.0]	57.4	[55.1-59.7]	27.5	[26.3-28.8]	8.5	[7.4-9.7]	13.2	[11.8-14.8]
Race and ethnicity										
White	62	[60.3-63.6]	66.1	[64.2-67.9]	21.9	[20.9-22.9]	8.7	[7.7-9.7]	12.5	[11.1-14.1]
Black	79.9	[77.4-82.1]	70.1	[67.8-72.3]	36.2	[33.8-38.6]	12	[10.7-13.4]	19.3	[17.3-21.5]
Hispanic	67.3	[62.5-71.8]	68.1	[61.7-73.9]	37.7	[32.4-43.3]	5	[3.6-6.9]	24.5	[18.9-31.0]
Other	62.4	[56.4-68.0]	45.7	[37.9-53.7]	26.8	[22.8-31.2]	8	[5.9-10.9]	15.3	[10.9-21.1]
Highest Education Attained										
Less than High school	70	[67.4-72.4]	67.2	[64.5-69.8]	31.3	[28.9-33.8]	11.5	[10.1-13.2]	23.4	[20.7-26.4]
High School	65.3	[63.0-67.4]	68.8	[66.0-71.5]	27	[25.0-29.1]	9.3	[8.0-10.7]	14.6	[12.7-16.8]
Some College	62.6	[59.4-65.7]	68	[64.7-71.1]	22.8	[21.1-24.7]	9.8	[8.3-11.5]	11.8	[10.2-13.6]
Bachelor or more	59	[56.4-61.6]	60.6	[57.9-63.3]	18.6	[16.9-20.4]	5.3	[4.4-6.3]	7.9	[6.7-9.3]
Marital Status										
Married or living together	61.9	[60.2-63.5]	62.7	[60.5-64.8]	23.7	[22.4-25.1]	6.6	[5.7-7.6]	11.8	[10.5-13.2]
Separated or Divorced	62.7	[58.3-67.0]	67.6	[63.5-71.5]	27.3	[24.9-29.8]	16.1	[13.9-18.6]	17	[14.6-19.7]
Widowed	68.9	[66.7-71.1]	72.7	[70.1-75.2]	24.2	[22.7-25.8]	9	[7.8-10.4]	17.3	[15.0-19.8]
Never married	64	[57.2-70.4]	61.8	[54.5-68.5]	27.9	[23.3-33.1]	12.4	[9.4-16.3]	18.3	[13.2-24.7]

TABLE 3.0-10: PREVALENCE OF RISK FACTORS BY DESCRIPTIVE CHARACTERISTICS OF AMERICAN OLDER ADULTS (II)

	HBP		CENTRAL OBESITY		DIABETES		TOBACCO USE		DEPRESSIVE SYMPTOMS	
	%	CI 95%	%	CI 95%	%	CI 95%	%	CI 95%	%	CI 95%
Neighborhood social cohesion										
Highest Social Cohesion	61.7	[59.5-63.9]	66.6	[64.1-68.9]	22.1	[20.6-23.7]	7.2	[6.3-8.3]	11.7	[10.3-13.3]
Moderate Social Cohesion	65.8	[63.5-67.9]	63.7	[61.1-66.2]	25.2	[23.8-26.7]	9.4	[8.1-10.9]	14.9	[13.5-16.5]
Lowest Social Cohesion	66.5	[63.6-69.2]	68.3	[64.8-71.5]	30.2	[27.5-33.0]	11.3	[9.3-13.7]	19.6	[16.9-22.7]
Presence of litter, graffiti and vacant houses										
No	63.6	[62.2-65.0]	65.8	[64.0-67.4]	24.2	[23.3-25.1]	8.3	[7.5-9.2]	13.5	[12.3-14.8]
Yes	68.3	[63.3-72.8]	65.7	[59.0-71.9]	29.1	[24.6-34.1]	13.6	[10.3-17.7]	22.5	[18.6-26.9]
Social services recipient										
No	62.7	[61.2-64.3]	65.1	[63.4-66.8]	23.2	[22.2-24.3]	7.9	[7.1-8.8]	11.7	[10.5-13.0]
Yes	69.2	[66.1-72.1]	69	[65.6-72.2]	33.5	[31.2-35.9]	14.4	[12.3-16.7]	24.5	[21.8-27.5]
Has a regular source of care										
No	36.8	[32.4-41.5]	51.3	[45.4-57.2]	10.4	[7.8-13.8]	19.9	[16.0-24.6]	12.5	[9.1-16.9]
Yes	65.2	[63.8-66.5]	66.5	[64.8-68.2]	25.3	[24.3-26.2]	8	[7.2-8.9]	14.1	[12.8-15.5]
Type of health insurance										
Just Medicare	60.9	[58.4-63.3]	64.4	[61.9-66.9]	24.1	[22.7-25.6]	9.4	[7.9-11.0]	14.4	[12.9-16.1]
Medigap	63.9	[61.9-65.8]	67	[65.0-68.9]	22.1	[20.8-23.4]	7.1	[6.3-7.9]	11.1	[9.7-12.6]
Medicaid	70.4	[66.9-73.6]	66.4	[62.3-70.3]	35.5	[32.2-39.0]	13.4	[11.1-16.1]	27.3	[24.3-30.5]
Tricare	67.3	[61.2-72.8]	60.3	[55.0-65.4]	27.6	[23.5-32.0]	9.9	[7.3-13.3]	12.8	[9.9-16.3]
Has drug insurance										
No	65.3	[63.7-66.8]	66.6	[64.7-68.4]	25.6	[24.6-26.6]	8.3	[7.5-9.2]	13.5	[12.2-14.9]
Yes	54.7	[50.8-58.6]	60	[56.3-63.7]	16.2	[13.8-19.0]	12	[10.0-14.3]	17.9	[15.1-21.0]

TABLE 3.0-11: PREVALENCE OF RISK FACTORS BY DESCRIPTIVE CHARACTERISTICS OF AMERICAN OLDER ADULTS (III)

	HBP		CENTRAL OBESITY		DIABETES		TOBACCO USE		DEPRESSIVE SYMPTOMS	
	%	CI 95%	%	CI 95%	%	CI 95%	%	CI 95%	%	CI 95%
Walked for exercise last month	68.2	[66.3-70.1]	71.9	[70.0-73.6]	29.3	[27.9-30.7]	11.5	[10.2-12.9]	21	[18.8-23.3]
No	61	[59.1-63.0]	62.2	[59.8-64.5]	21.5	[20.4-22.8]	6.9	[6.2-7.7]	9.7	[8.7-10.8]
Yes										
Functional status										
Minimal limitations	50.8	[47.8-53.7]	53.7	[50.2-57.2]	13.8	[11.7-16.1]	7	[5.8-8.4]	4.9	[3.6-6.8]
Mild Limitations	62.1	[59.5-64.7]	65.1	[62.1-67.9]	20.6	[18.7-22.7]	10.4	[8.9-12.1]	8.9	[7.4-10.7]
Moderate limitations	72.6	[69.8-75.2]	72.2	[69.1-75.0]	31.4	[29.1-33.8]	8.2	[6.8-9.9]	16.4	[14.1-19.0]
Severe limitations	72.4	[69.5-75.2]	77.1	[73.4-80.4]	35	[32.7-37.3]	7.2	[6.0-8.7]	29.3	[26.1-32.7]
Number of comorbidities										
No comorbidities	61.1	[59.4-62.7]	65.4	[63.2-67.5]	24	[22.6-25.5]	8.2	[7.5-9.1]	12.1	[10.7-13.6]
One comorbidity	66.8	[64.4-69.2]	65.7	[62.7-68.5]	24.7	[23.1-26.4]	8	[6.8-9.4]	15	[13.4-16.9]
Two comorbidities	68.2	[63.8-72.3]	68.1	[63.6-72.3]	25.2	[22.6-27.9]	11.2	[9.0-13.9]	21	[17.8-24.8]
Three or more comorbidities	78.7	[68.3-86.4]	72.3	[60.2-81.8]	27.1	[22.1-32.7]	14	[9.5-20.0]	32.1	[20.9-45.9]
Had a doctor visit in the last 12 months										
No	30.1	[26.1-34.4]	58.3	[52.4-64.0]	6.9	[5.2-9.1]	17.9	[14.1-22.3]	11	[8.0-15.0]
Yes	66.4	[65.0-67.7]	66.3	[64.5-68.0]	25.8	[24.9-26.8]	7.9	[7.2-8.8]	14.3	[13.0-15.7]
Has been admitted in the hospital last 12 months										
No	61.2	[59.5-62.8]	65.4	[63.6-67.1]	6.9	[5.2-9.1]	8.6	[7.7-9.6]	11.8	[10.5-13.2]
Yes	74.2	[71.7-76.5]	67.5	[64.4-70.4]	25.8	[24.9-26.8]	8.7	[7.2-10.6]	22.8	[20.4-25.3]

Prevalence of CVDs and lung diseases varied significantly with highest education attained, perceived neighborhood social cohesion.

Figure 16. Prevalence of Cardiovascular Risk Factors by Educational Attainment

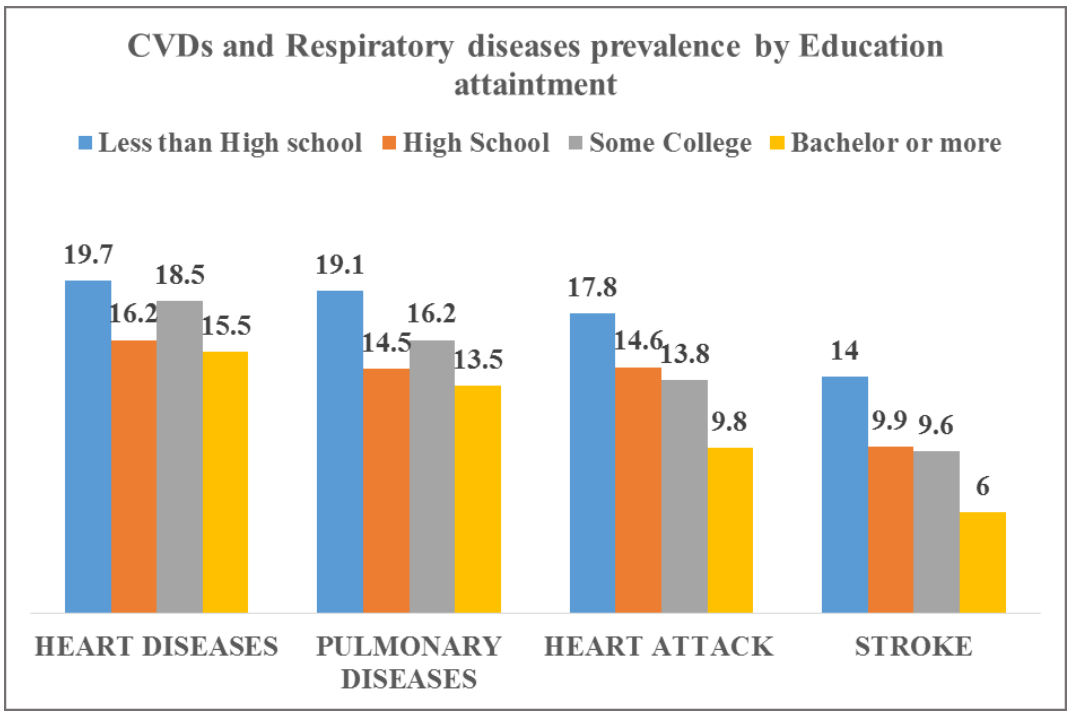


Figure 17. Prevalence of Cardiovascular Risk Factors by Perceived Neighborhood Social Cohesion

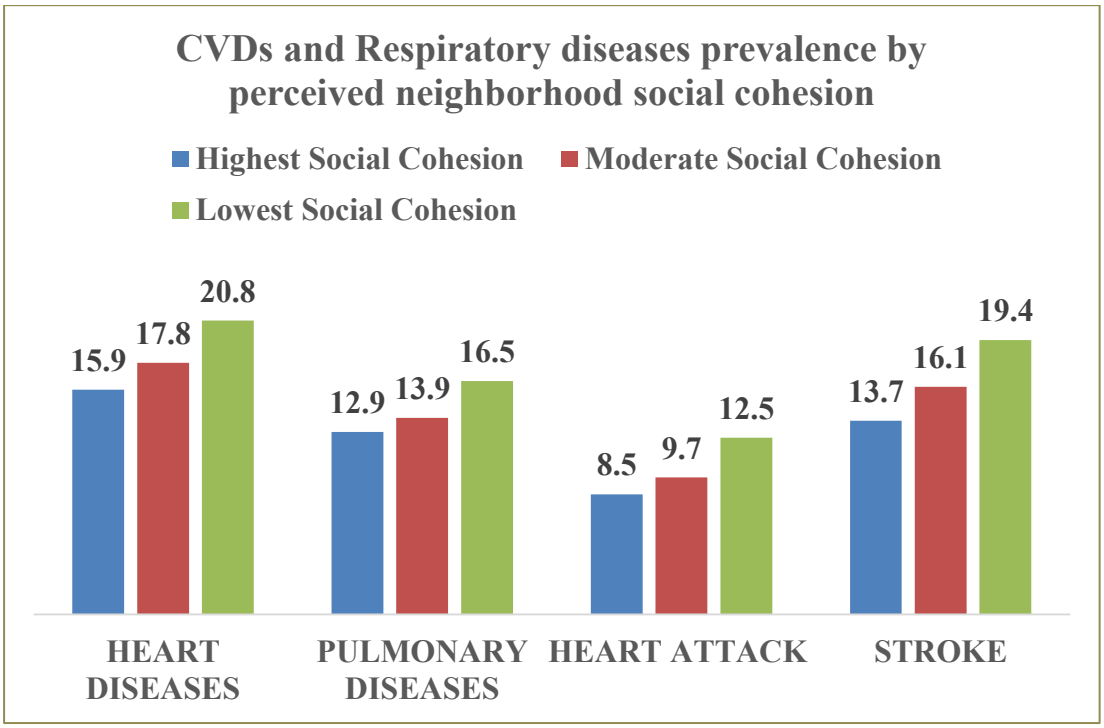


TABLE 3.0-12. PREVALENCE OF CARDIOVASCULAR AND RESPIRATORY DISEASES BY DESCRIPTIVE CHARACTERISTICS OF AMERICAN OLDER ADULTS (I)

	HEART DISEASES		HEART ATTACK		STROKE		PULMONARY DISEASES	
	%	CI 95%	%	CI 95%	%	CI 95%	%	CI 95%
Age (years)								
65 – 69	13.7	[12.1.15.5]	9.7	[7.9.11.9]	6.3	[4.9.8.0]	14.9	[13.4.16.5]
70 – 74	15.4	[13.3.17.7]	13.1	[11.2.15.2]	8.4	[7.2.9.8]	16.1	[14.2.18.3]
75 – 79	18.5	[16.5.20.6]	14.7	[12.8.16.8]	9.7	[8.3.11.3]	16.7	[14.6.19.1]
80 – 84	21.1	[18.9.23.6]	17.3	[15.3.19.6]	14.4	[12.6.16.4]	15.5	[13.7.17.5]
85 - 89	23.2	[20.3.26.3]	19	[15.9.22.4]	15	[12.5.17.9]	13.4	[11.7.15.3]
More than 90	26.4	[23.0.30.2]	21.3	[17.5.25.7]	14.8	[12.1.18.0]	11.1	[7.9.15.3]
Sex								
Female	15.2	[13.9.16.6]	10.4	[9.3.11.6]	9.6	[8.6.10.8]	16.7	[15.4.18.1]
Male	19.9	[18.3.21.6]	18	[16.5.19.5]	9.6	[8.6.10.7]	13.8	[12.5.15.3]
Race and ethnicity								
White	18.1	[17.1.19.2]	14	[12.9.15.2]	9.4	[8.6.10.2]	15.6	[14.5.16.8]
Black	15.6	[13.6.17.8]	13	[11.2.15.1]	12.2	[10.5.14.2]	15	[13.1.17.2]
Hispanic	12.3	[9.8.15.3]	12.3	[9.8.15.3]	9.5	[6.6.13.6]	15	[11.8.18.9]
Other	14.1	[10.1.19.4]	13.6	[10.1.18.0]	9.6	[7.0.13.0]	13.2	[9.6.18.0]
Highest Education Attained								
Less than High school	19.7	[17.4.22.1]	17.8	[15.7.20.2]	14	[12.2.16.1]	19.1	[17.1.21.3]
High School	16.2	[14.3.18.3]	14.6	[12.9.16.4]	9.9	[8.4.11.6]	14.5	[12.8.16.5]
Some College	18.5	[16.3.20.9]	13.8	[11.9.16.0]	9.6	[7.8.11.6]	16.2	[14.0.18.8]
Bachelor or more	15.5	[13.9.17.4]	9.8	[8.4.11.4]	6	[4.9.7.4]	13.5	[11.8.15.3]
Marital Status								
Married or living together	16.8	[15.6.18.2]	13.4	[12.3.14.5]	8.3	[7.3.9.4]	13.4	[12.2.14.7]
Separated or Divorced	15.7	[12.7.19.2]	12.7	[10.4.15.5]	10.2	[8.4.12.3]	19.1	[16.2.22.3]
Widowed	19.7	[17.7.21.8]	15.7	[13.9.17.7]	12.8	[11.3.14.6]	18.1	[16.2.20.3]
Never married	14.1	[9.9.19.8]	9.5	[6.0.14.5]	6.3	[4.0.9.6]	17.4	[11.9.24.7]

CI: Confidence interval

TABLE 3.0-13: PREVALENCE OF CARDIOVASCULAR AND RESPIRATORY DISEASES BY DESCRIPTIVE CHARACTERISTICS OF AMERICAN OLDER ADULTS (II)

	HEART DISEASES		HEART ATTACK		STROKE		PULMONARY DISEASES	
	%	CI 95%	%	CI 95%	%	CI 95%	%	CI 95%
Neighborhood social cohesion								
Highest Social Cohesion	15.9	[14.6.17.3]	12.9	[11.7.14.2]	8.5	[7.6.9.6]	13.7	[12.4.15.3]
Moderate Social Cohesion	17.8	[16.1.19.8]	13.9	[12.3.15.7]	9.7	[8.5.11.1]	16.1	[14.5.17.9]
Lowest Social Cohesion	20.8	[18.2.23.7]	16.5	[14.2.19.0]	12.5	[10.6.14.7]	19.4	[16.9.22.1]
Presence of litter. graffiti and vacant houses								
No	17.2	[16.2.18.2]	13.7	[12.7.14.7]	9.4	[8.6.10.2]	15.2	[14.2.16.2]
Yes	19.7	[15.5.24.7]	15	[11.5.19.4]	13.7	[10.5.17.8]	19.6	[15.6.24.3]
Social services recipient								
No	16.4	[15.3.17.6]	12.8	[11.7.14.0]	8.4	[7.7.9.3]	14.1	[13.1.15.1]
Yes	21.2	[19.0.23.6]	17.9	[15.5.20.7]	14.7	[12.7.16.9]	22.2	[19.8.24.8]
Has a regular source of care								
No	10.2	[7.6.13.5]	11	[8.0.14.9]	8.7	[6.2.12.2]	12.4	[8.6.17.5]
Yes	17.7	[16.6.18.7]	13.9	[12.9.14.9]	9.7	[8.9.10.6]	15.6	[14.6.16.6]
Type of health insurance								
Just Medicare	15.4	[13.8.17.2]	13.5	[11.9.15.4]	8.7	[7.5.10.2]	13.7	[12.4.15.1]
Medigap	17.6	[16.1.19.2]	12.5	[11.4.13.7]	8.9	[8.0.9.9]	14.8	[13.6.16.2]
Medicaid	22.2	[19.2.25.5]	18.5	[15.7.21.8]	15	[12.5.17.9]	22.8	[20.0.25.8]
Tricare	15.6	[11.4.20.9]	16.8	[13.8.20.4]	10.5	[7.9.13.8]	15.7	[11.6.20.9]
Has drug insurance								
No	17.6	[16.5.18.7]	14	[12.9.15.3]	9.6	[8.8.10.4]	16.1	[15.0.17.2]
Yes	14.8	[12.5.17.6]	11.4	[9.4.13.8]	9.6	[8.0.11.5]	12.1	[9.7.14.9]

CI: confidence interval

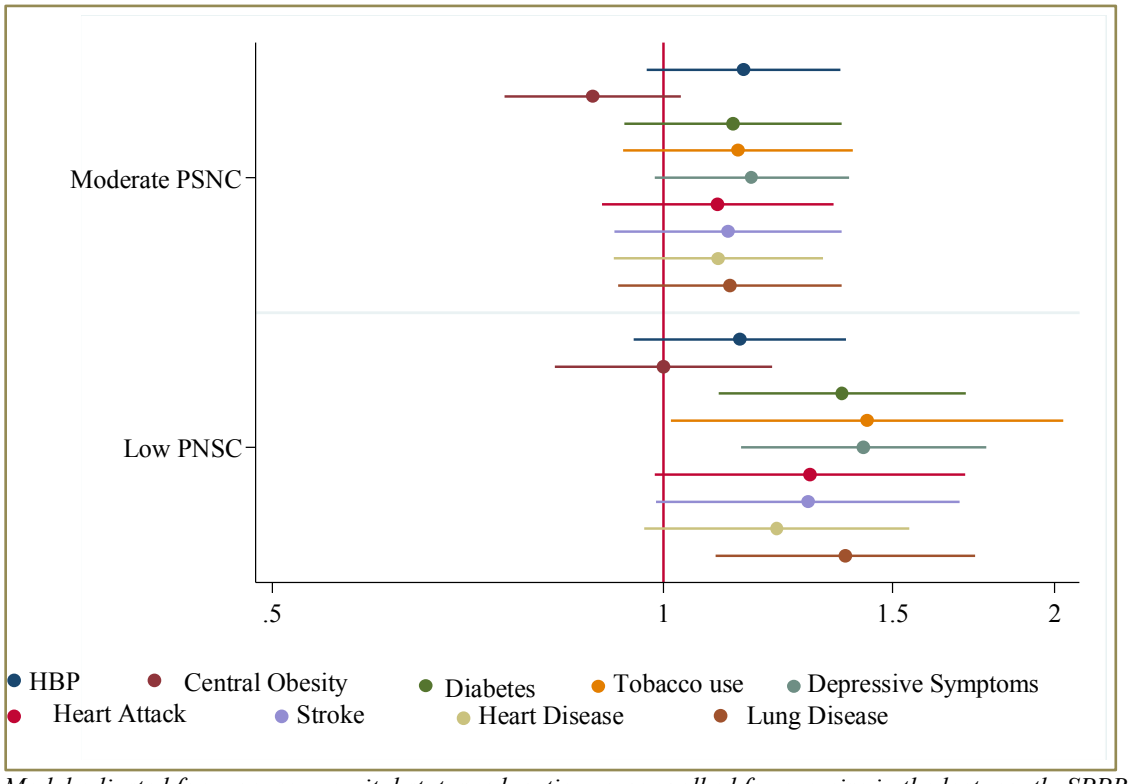
TABLE 3.0-14: PREVALENCE OF CARDIOVASCULAR AND RESPIRATORY DISEASES BY DESCRIPTIVE CHARACTERISTICS OF AMERICAN OLDER ADULTS (III)

	HEART DISEASES		HEART ATTACK		STROKE		PULMONARY DISEASES	
	%	CI 95%	%	CI 95%	%	CI 95%	%	CI 95%
Walked for exercise last month								
No	20.7	[18.7.22.8]	17.1	[15.7.18.6]	12.7	[11.3.14.3]	19.5	[18.0.21.1]
Yes	15.1	[14.1.16.2]	11.7	[10.6.12.9]	7.7	[6.9.8.5]	12.9	[11.7.14.1]
Functional status								
Minimal limitations	10.6	[8.5.13.1]	8.2	[6.7.10.0]	2.9	[2.2.3.8]	10.9	[9.1.13.0]
Mild Limitations	14.8	[13.2.16.6]	12	[10.4.13.7]	6.3	[5.2.7.6]	13.9	[12.1.15.9]
Moderate limitations	20.1	[17.8.22.6]	16.5	[14.7.18.5]	11.4	[9.6.13.4]	17.6	[15.4.20.0]
Severe limitations	25.3	[22.6.28.2]	19.3	[17.2.21.5]	20.8	[18.7.22.9]	20.6	[18.3.23.2]
Number of comorbidities								
No comorbidities	15.1	[14.0.16.2]	12.2	[11.2.13.3]	8.1	[7.1.9.2]	12.2	[11.1.13.3]
1 Comorbidities	19.5	[17.7.21.4]	15.8	[13.9.17.8]	10	[8.6.11.7]	18.8	[17.1.20.6]
2 Comorbidities	21.8	[18.8.25.1]	15.2	[12.4.18.4]	16.8	[14.0.20.0]	22.4	[18.4.27.0]
3 or more comorbidities	29.9	[20.6.41.2]	18.7	[11.1.29.7]	24.1	[15.6.35.3]	24	[13.9.38.0]
Had a doctor visit in the last 12 months								
No	8.1	[5.9.11.0]	7.2	[4.9.10.4]	5.9	[3.8.9.0]	11.7	[8.8.15.5]
Yes	18	[17.0.19.0]	14.2	[13.2.15.3]	9.9	[9.0.10.9]	15.7	[14.7.16.8]
Has been admitted in the hospital last 12 months								
No	14.1	[13.1.15.1]	11.6	[10.6.12.6]	7.9	[7.1.8.8]	13.6	[12.7.14.7]
Yes	29.9	[27.6.32.4]	22.2	[20.0.24.7]	16.2	[14.5.18.0]	22.4	[19.9.25.2]

CI: Confidence interval

In the next pages, detailed tables will present the individual logistic regression models for each component of the ROCE. Figure 17 presents an overview of how perceived neighborhood social cohesion (PNSC) is associated with each of the risk factors and diseases adjusted by covariates. Indeed, low PNSC increases the likelihood of suffering from all the health outcomes except for abdominal obesity. However, these increases are only statistically significant for diabetes, tobacco use, depressive symptoms, and lung disease.

Figure 18. Association of PNSC with Medical Risk Factors and Cardiovascular Disease



Model adjusted for: age, sex, marital status, education, race, walked for exercise in the last month, SPPB score for physical limitations, number of comorbidities, prescription drug insurance, regular source of care, any doctor visits in the last 12 months, and, any hospital stay in the last 12 months.

The next figure (Figure 18), shows how walking for exercise in the last month is associated with each of the risk factors and cardio-respiratory diseases in the adjusted models. There is a significant reduction in the odds of suffering high ROCE adjusted when the respondent reports that he or she walked in the last month for exercise. This reduction remains significant after adjusting for covariables except for: diabetes, stroke and heart disease.

Figure 19. Associations between Walking for Exercise and all Cardiovascular Risk Factors and CVDs

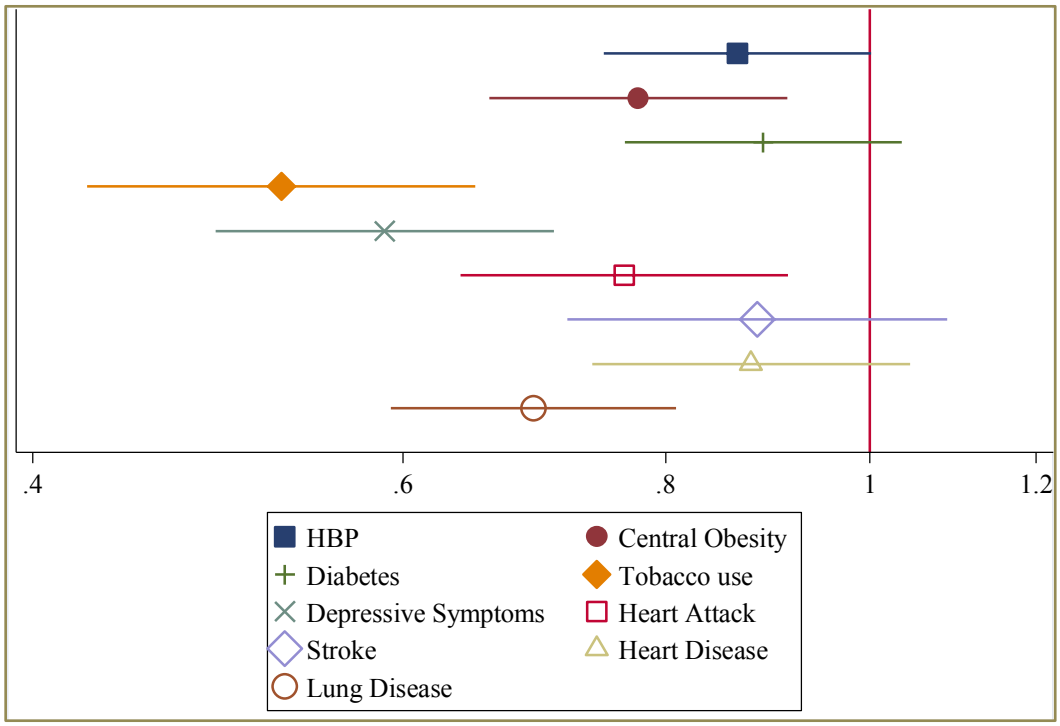


Figure 18. Associations between walking for exercise in the last month and all cardiovascular risk factors and cardio-respiratory diseases in each individual logistic regression model. Model adjusted for: age, sex, marital status, education, race, walked for exercise in the last month, SPPB score for physical limitations, number of comorbidities, prescription drug insurance, regular source of care, any doctor visits in the last 12 months, and, any hospital stay in the last 12 months.

The following section tables will describe the logistic regression models for each ROCE component. Table 3.0-15 shows the unadjusted and adjusted logistic regression models for HBP. Keys results for PNSC, street disorder and social services recipient were discussed above.

TABLE 3.0-15: HBP LOGISTIC REGRESSION MODELS - SOCIAL RISK FACTORS

	MODEL 1[a]		MODEL 2[b]	
	OR	**IC 95%**	**OR**	**IC 95%**
Gender (Male)	0.86**	[0.77 - 0.97]	1.01	[0.84 - 1.20]
Race and Ethnicity				
White	1		1	
Black	2.44***	[2.06 - 2.89]	2.30***	[1.90 - 2.77]
Hispanic	1.26**	[1.02 - 1.57]	1.06	[0.82 - 1.38]
Other	1.02	[0.77 - 1.34]	1.23	[0.78 - 1.94]
Marital Status				
Married or living together	1		1	
Separated or Divorced	1.04	[0.85 - 1.26]	0.97	[0.78 - 1.22]
Widowed	1.37***	[1.21 - 1.54]	1.12	[0.95 - 1.33]
Never married	1.10	[0.83 - 1.45]	1.13	[0.80 - 1.58]
Education Status				
Less than High School	1		1	
High School	0.81***	[0.69 - 0.94]	0.94	[0.80 - 1.10]
Some College	0.72***	[0.61 - 0.85]	0.85	[0.70 - 1.04]
Bachelor or superior	0.62***	[0.53 - 0.72]	0.82**	[0.68 - 1.00]
Social services recipient	1.33***	[1.14 - 1.56]	0.96	[0.80 - 1.14]
Perceived Neighborhood Social Cohesion				
High	1		1	
Moderate	1.19**	[1.03 - 1.38]	1.15	[0.97 - 1.37]
Low	1.23**	[1.05 - 1.44]	1.14	[0.95 - 1.38]
Street disorder [c]	1.23*	[0.98 - 1.55]	1.09	[0.80 - 1.47]
Walked for exercise last	0.73***	[0.64 - 0.83]	0.87*	[0.75 - 1.00]
Functional status				
No Limitations	1		1	
Mild Limitations	1.59***	[1.36 - 1.86]	1.45***	[1.23 - 1.71]
Moderate limitations	2.57***	[2.10 - 3.13]	2.10***	[1.69 - 2.61]
Severe limitations	2.55***	[2.13 - 3.05]	1.83***	[1.48 - 2.27]

*** ***p<0.01***; ** ***p<0.05***; * ***p<0.1***

[a] Model without adjustment of variables

[b] Model adjusted by age, number of comorbidities, prescription drug insurance, regular source of care, any doctor visits in the last 12 months, any hospital stay in the last 12 months, and having no one to talk (isolation). [c] Presence of litter, graffiti and vacant houses

Table 3.0-16 shows the unadjusted and adjusted logistic regression models for Central Obesity. Keys results for PNSC, street disorder and social services recipient were discussed above.

TABLE 3.0-16. CENTRAL OBESITY LOGISTIC REGRESSION MODELS - SOCIAL RISK FACTORS

	MODEL 1[a]		MODEL 2[b]	
	OR	**IC 95%**	**OR**	**IC 95%**
Gender (Male)	0.54***	[0.48 - 0.60]	0.64***	[0.56 - 0.73]
Race and Ethnicity				
White	1		1	
Black	1.25***	[1.10 - 1.41]	1.02	[0.88 - 1.19]
Hispanic	1.12	[0.86 - 1.45]	1.08	[0.83 - 1.40]
Other	0.42***	[0.30 - 0.58]	0.45***	[0.30 - 0.67]
Marital Status				
Married or living together	1		1	
Separated or Divorced	1.24**	[1.01 - 1.52]	1.04	[0.82 - 1.32]
Widowed	1.53***	[1.33 - 1.74]	1.25***	[1.09 - 1.43]
Never married	1.02	[0.76 - 1.37]	0.76	[0.53 - 1.08]
Education Status				
Less than High School	1		1	
High School	1.09	[0.95 - 1.25]	1.14	[0.96 - 1.36]
Some College	1.06	[0.87 - 1.27]	1.13	[0.91 - 1.41]
Bachelor or superior	0.79***	[0.68 - 0.92]	1.00	[0.82 - 1.22]
Social services recipient	1.17**	[1.02 - 1.34]	1.02	[0.85 - 1.21]
Perceived Neighborhood Social Cohesion				
High	1		1	
Moderate	0.90	[0.77 - 1.04]	0.88	[0.75 - 1.03]
Low	1.08	[0.90 - 1.29]	1.00	[0.82 - 1.21]
Street disorder [c]	1.07	[0.81 - 1.42]	0.90	[0.65 - 1.25]
Walked for exercise last month	0.65***	[0.57 - 0.74]	0.78***	[0.66 - 0.91)
Functional status				
No Limitations	1		1	
Mild Limitations	1.55***	[1.30 - 1.84]	1.64***	[1.37 - 1.96]
Moderate limitations	2.15***	[1.77 - 2.61]	2.47***	[1.94 - 3.14]
Severe limitations	2.64***	[2.08 - 3.35]	3.43***	[2.51 - 4.68]

*** ***p<0.01***; ** ***p<0.05***; * ***p<0.1***

[a] Model without adjustment of variables

[b] Model adjusted by age, number of comorbidities, prescription drug insurance, regular source of care, any doctor visits in the last 12 months, any hospital stay in the last 12 months, and having no one to talk (isolation).

[c] Presence of litter, graffiti and vacant houses

Table 3.0-17 shows the unadjusted and adjusted logistic regression models for Diabetes.

Keys results for PNSC, street disorder and social services recipient were discussed above.

TABLE 3.0-17. DIABETES LOGISTIC REGRESSION MODELS - SOCIAL RISK FACTORS

	MODEL 1[a]		MODEL 2[b]	
	OR	**IC 95%**	**OR**	**IC 95%**
Gender (Male)	1.33***	[1.18 - 1.49]	1.70***	[1.44 - 2.01]
Race and Ethnicity				
White	1		1	
Black	2.21***	[1.89 - 2.58]	1.74***	[1.45 - 2.08]
Hispanic	1.94***	[1.48 - 2.55]	1.45**	[1.05 - 1.99]
Other	1.37**	[1.01 - 1.86]	1.80***	[1.25 - 2.61]
Marital Status				
Married or living together	1		1	
Separated or Divorced	1.15	[0.94 - 1.41]	0.97	[0.72 - 1.31]
Widowed	1.12*	[0.98 - 1.29]	1.19*	[0.99 - 1.44]
Never married	1.13	[0.83 - 1.54]	0.82	[0.57 - 1.18]
Education Status				
Less than High School	1		1	
High School	0.73***	[0.62 - 0.86]	0.86	[0.72 - 1.04]
Some College	0.66***	[0.55 - 0.78]	0.87	[0.71 - 1.07]
Bachelor or superior	0.53***	[0.45 - 0.63]	0.72***	[0.58 - 0.90]
Social services recipient	1.66***	[1.41 - 1.96]	1.04	[0.82 - 1.31]
Perceived Neighborhood Social Cohesion				
High	1		1	
Moderate	1.21**	[1.03 - 1.43]	1.13	[0.93 - 1.37]
Low	1.58***	[1.29 - 1.92]	1.37***	[1.10 - 1.71]
Street disorder [c]	1.41***	[1.11 - 1.78]	0.92	[0.67 - 1.26]
Walked for exercise last month	0.72***	[0.64 - 0.81]	0.89	[0.76 - 1.04]
Functional status				
No Limitations	1		1	
Mild Limitations	1.54***	[1.17 - 2.02]	1.67***	[1.26 - 2.22]
Moderate limitations	2.62***	[2.10 - 3.27]	2.96***	[2.29 - 3.82]
Severe limitations	3.17***	[2.48 - 4.05]	3.88***	[2.91 - 5.18]

*** ***p<0.01***; ** ***p<0.05***; * ***p<0.1***

[a] Model without adjustment of variables

[b] Model adjusted by age, number of comorbidities, prescription drug insurance, regular source of care, any doctor visits in the last 12 months, any hospital stay in the last 12 months, and having no one to talk (isolation).

[c] Presence of litter, graffiti and vacant houses

Table 3. 0-18 shows the unadjusted and adjusted logistic regression models for Tobacco use. Keys results for PNSC, street disorder and social services recipient were discussed above.

TABLE 3. 0-18. TOBACCO USE LOGISTIC REGRESSION MODELS - SOCIAL RISK FACTORS

	MODEL 1[a]		MODEL 2[b]	
	OR	**IC 95%**	**OR**	**IC 95%**
Gender (Male)	0.92	[0.77 - 1.10]	0.99	[0.79 - 1.24]
Race and Ethnicity				
White	1		1	
Black	1.43***	[1.20 - 1.69]	0.79*	[0.62 - 1.00]
Hispanic	0.65**	[0.43 - 0.97]	0.30***	[0.16 - 0.55]
Other	1.07	[0.69 - 1.64]	1.01	[0.56 - 1.81]
Marital Status				
Married or living together	1		1	
Separated or Divorced	2.68***	[2.12 - 3.39]	2.17***	[1.63 - 2.89]
Widowed	1.32***	[1.08 - 1.62]	1.74***	[1.37 - 2.20]
Never married	1.94**	[1.15 - 3.26]	1.56	[0.79 - 3.09]
Education Status				
Less than High School	1		1	
High School	0.83	[0.63 - 1.10]	0.67**	[0.48 - 0.92]
Some College	0.84	[0.62 - 1.13]	0.68*	[0.46 - 1.01]
Bachelor or superior	0.46***	[0.35 - 0.60]	0.40***	[0.28 - 0.58]
Social services recipient	1.75***	[1.38 - 2.21]	1.24	[0.89 - 1.73]
Perceived Neighborhood Social Cohesion				
High	1		1	
Moderate	1.27**	[1.05 - 1.54]	1.14	[0.93 - 1.40]
Low	1.84***	[1.37 - 2.46]	1.43**	[1.01 - 2.03]
Street disorder [c]	2.06***	[1.39 - 3.07]	1.31	[0.83 - 2.08]
Walked for exercise last month	0.59***	[0.49 - 0.71]	0.53***	[0.42 - 0.65]
Functional status				
No Limitations	1		1	
Mild Limitations	1.76***	[1.30 - 2.39]	1.77***	[1.25 - 2.49]
Moderate limitations	1.34	[0.90 - 2.00]	1.36	[0.83 - 2.22]
Severe limitations	1.21	[0.90 - 1.62]	1.37	[0.92 - 2.04]

*** ***p<0.01***; ** ***p<0.05***; * ***p<0.1***

[a] Model without adjustment of variables

[b] Model adjusted by age, number of comorbidities, prescription drug insurance, regular source of care, any doctor visits in the last 12 months, any hospital stay in the last 12 months, and having no one to talk (isolation).

[c] Presence of litter, graffiti and vacant houses

RESULTS SECTION 3: EXAMINE THE INDIVIDUAL ASSOCIATION BETWEEN NEIGHBORHOOD SOCIAL COHESION AND COMPONENTS OF THE RISK OF CARDIOVASCULAR EVENTS (ROCE)

Table 3.0-19 shows the unadjusted and adjusted logistic regression models for Depressive symptoms. Keys results for PNSC, street disorder and social services recipient were discussed above.

TABLE 3.0-19: DEPRESSIVE SYMPTOMS LOGISTIC REGRESSION MODELS - SOCIAL RISK FACTORS

	MODEL 1[a]		MODEL 2[b]	
	OR	**IC 95%**	**OR**	**IC 95%**
Gender (Male)	0.88	[0.74 - 1.05]	1.13	[0.92 - 1.38]
Race and Ethnicity				
White	1		1	
Black	1.68***	[1.39 - 2.02]	1.06	[0.81 - 1.38]
Hispanic	2.27***	[1.60 - 3.20]	1.35	[0.88 - 2.05]
Other	1.26	[0.83 - 1.93]	1.17	[0.69 - 1.98]
Marital Status				
Married or living together	1		1	
Separated or Divorced	1.53***	[1.24 - 1.89]	1.09	[0.84 - 1.42]
Widowed	1.56***	[1.32 - 1.85]	1.08	[0.86 - 1.36]
Never married	1.67**	[1.12 - 2.50]	1.16	[0.66 - 2.03]
Education Status				
Less than High School	1		1	
High School	0.56***	[0.46 - 0.69]	0.75**	[0.58 - 0.97]
Some College	0.44***	[0.35 - 0.54]	0.61***	[0.47 - 0.80]
Bachelor or superior	0.28***	[0.22 - 0.35]	0.54***	[0.41 - 0.71]
Social services recipient	2.45***	[2.10 - 2.87]	1.27**	[1.04 - 1.55]
Perceived Neighborhood Social Cohesion				
High	1		1	
Moderate	1.32***	[1.12 - 1.56]	1.17*	[0.98 - 1.39]
Low	1.84***	[1.53 - 2.21]	1.43***	[1.15 - 1.77]
Street disorder [c]	1.85***	[1.46 - 2.35]	1.11	[0.78 - 1.59]
Walked for exercise last month	0.40***	[0.34 - 0.47]	0.59***	[0.49 - 0.71]
Functional status				
No Limitations	1		1	
Mild Limitations	1.88***	[1.30 - 2.74]	1.75***	[1.19 - 2.59]
Moderate limitations	3.79***	[2.53 - 5.69]	3.12***	[2.03 - 4.81]
Severe limitations	7.99***	[5.62 - 11.37]	5.75***	[3.97 - 8.33]

*** ***p<0.01***; ** ***p<0.05***; * ***p<0.1***

[a] Model without adjustment of variables

[b] Model adjusted by age, number of comorbidities, prescription drug insurance, regular source of care, any doctor visits in the last 12 months, any hospital stay in the last 12 months, and having no one to talk (isolation).

[c] Presence of litter, graffiti and vacant houses

Table 3.0-20 shows the unadjusted and adjusted logistic regression models for heart disease. Keys results for PNSC, street disorder and social services recipient were discussed above.

TABLE 3.0-20: HEART DISEASE LOGISTIC REGRESSION MODELS - SOCIAL RISK FACTORS

	MODEL 1[a]		MODEL 2[b]	
	OR	**IC 95%**	**OR**	**IC 95%**
Gender (Male)	1.39***	[1.19 - 1.61]	1.76***	[1.48 - 2.11]
Race and Ethnicity				
White	1		1	
Black	0.84**	[0.71 - 0.99]	0.65***	[0.52 - 0.80]
Hispanic	0.63***	[0.49 - 0.82]	0.38***	[0.29 - 0.52]
Other	0.74	[0.51 - 1.08]	0.57**	[0.34 - 0.97]
Marital Status				
Married or living together	1		1	
Separated or Divorced	0.92	[0.70 - 1.21]	1.00	[0.73 - 1.37]
Widowed	1.21**	[1.02 - 1.44]	1.07	[0.87 - 1.31]
Never married	0.81	[0.54 - 1.23]	0.86	[0.54 - 1.39]
Education Status				
Less than High School	1		1	
High School	0.79**	[0.65 - 0.96]	0.86	[0.68 - 1.10]
Some College	0.93	[0.76 - 1.13]	1.13	[0.88 - 1.46]
Bachelor or superior	0.75***	[0.61 - 0.92]	1.04	[0.81 - 1.33]
Social services recipient	1.37***	[1.17 - 1.61]	1.42***	[1.17 - 1.73]
Perceived Neighborhood Social Cohesion				
High	1		1	
Moderate	1.15*	[0.97 - 1.35]	1.10	[0.92 - 1.33]
Low	1.39***	[1.13 - 1.70]	1.22*	[0.97 - 1.55]
Street disorder c	1.18	[0.88 - 1.60]	1.16	[0.83 - 1.62]
Walked for exercise last month	0.68***	[0.59 - 0.80]	0.88	[0.74 - 1.04]
Functional status				
No Limitations				
Mild Limitations	1.48**	[1.08 - 2.02]	1.45**	[1.07 - 1.97]
Moderate limitations	2.13***	[1.61 - 2.83]	1.93***	[1.44 - 2.57]
Severe limitations	2.87***	[2.11 - 3.89]	2.19***	[1.57 - 3.06]

*** ***p<0.01***; ** ***p<0.05***; * ***p<0.1***

[a] Model without adjustment of variables

[b] Model adjusted by age, number of comorbidities, prescription drug insurance, regular source of care, any doctor visits in the last 12 months, any hospital stay in the last 12 months, and having no one to talk (isolation).

[c] Presence of litter, graffiti and vacant houses

Table 3.0-21 shows the unadjusted and adjusted logistic regression models for heart attack. Keys results for PNSC, street disorder and social services recipient were discussed above.

TABLE 3.0-21. HEART ATTACK LOGISTIC REGRESSION MODEL- SOCIAL RISK FACTORS

	MODEL 1[a]		MODEL 2[b]	
	OR	**IC 95%**	**OR**	**IC 95%**
Gender (Male)	1.89***	[1.62 - 2.20]	2.50***	[2.10 - 2.99]
Race and Ethnicity				
White	1		1	
Black	0.92	[0.76 - 1.12]	0.81	[0.63 - 1.05]
Hispanic	0.86	[0.66 - 1.14]	0.58***	[0.42 - 0.81]
Other	0.97	[0.69 - 1.35]	0.93	[0.57 - 1.51]
Marital Status				
Married or living together	1		1	
Separated or Divorced	0.95	[0.75 - 1.19]	0.96	[0.72 - 1.29]
Widowed	1.21**	[1.02 - 1.43]	1.16	[0.92 - 1.46]
Never married	0.68	[0.42 - 1.10]	0.59*	[0.34 - 1.04]
Education Status				
Less than High School	1		1	
High School	0.79**	[0.65 - 0.95]	0.88	[0.70 - 1.09]
Some College	0.74**	[0.59 - 0.93]	0.96	[0.74 - 1.24]
Bachelor or superior	0.50***	[0.40 - 0.62]	0.61***	[0.46 - 0.80]
Social services recipient	1.49***	[1.21 - 1.83]	1.25*	[0.98 - 1.59]
Perceived Neighborhood Social Cohesion				
High	1		1	
Moderate	1.09	[0.92 - 1.30]	1.10	[0.90 - 1.35)
Low	1.33***	[1.07 - 1.65]	1.30*	[0.98 - 1.71)
Street disorder c	1.11	[0.81 - 1.53]	0.94	[0.61 - 1.46)
Walked for exercise last month	0.64***	[0.56 - 0.74]	0.76***	[0.64 - 0.91)
Functional status				
No Limitations	1		1	
Mild Limitations	1.53***	[1.15 - 2.02]	1.34*	[0.99 - 1.80]
Moderate limitations	2.23***	[1.77 - 2.80]	1.74***	[1.34 - 2.27]
Severe limitations	2.68***	[2.03 - 3.54]	1.73***	[1.20 - 2.47]

*** ***p<0.01***; ** ***p<0.05***; * ***p<0.1***

[a] Model without adjustment of variables

[b] Model adjusted by age, number of comorbidities, prescription drug insurance, regular source of care, any doctor visits in the last 12 months, any hospital stay in the last 12 months, and having no one to talk (isolation).

[c] Presence of litter, graffiti and vacant houses

Table 3.0-22 shows the unadjusted and adjusted logistic regression models for stroke.

Keys results for PNSC, street disorder and social services recipient were discussed above.

TABLE 3.0-22: STROKE LOGISTIC REGRESSION MODELS - SOCIAL RISK FACTORS

	MODEL 1[a]		MODEL 2[b]	
	OR	**IC 95%**	**OR**	**IC 95%**
Gender (Male)	1.00	[0.84 - 1.18]	1.42***	[1.17 - 1.73]
Race and Ethnicity				
White	1		1	
Black	1.35***	[1.13 - 1.61]	0.89	[0.72 - 1.11]
Hispanic	1.02	[0.69 - 1.50]	0.60**	[0.37 - 0.99]
Other	1.02	[0.72 - 1.46]	1.11	[0.66 - 1.86]
Marital Status				
Married or living together	1		1	
Separated or Divorced	1.25*	[0.96 - 1.63]	1.07	[0.77 - 1.48]
Widowed	1.63***	[1.35 - 1.97]	1.12	[0.88 - 1.43]
Never married	0.74	[0.46 - 1.18]	0.62*	[0.36 - 1.07]
Education Status				
Less than High School	1		1	
High School	0.68***	[0.54 - 0.85]	0.86	[0.67 - 1.11]
Some College	0.65***	[0.50 - 0.85]	0.90	[0.66 - 1.23]
Bachelor or superior	0.39***	[0.30 - 0.52]	0.67**	[0.47 - 0.96]
Social services recipient	1.87***	[1.55 - 2.26]	1.18	[0.90 - 1.55]
Neighborhood Social Cohesion				
High	1		1	
Moderate	1.15	[0.96 - 1.37]	1.12	[0.92 - 1.37]
Low	1.53***	[1.23 - 1.90]	1.29*	[0.99 - 1.69]
Street disorder [c]	1.54***	[1.12 - 2.13]	1.37	[0.93 - 2.04]
Walked for exercise last month	0.57***	[0.48 - 0.68]	0.88	[0.72 - 1.09]
Functional status				
No Limitations	1		1	
Mild Limitations	2.30***	[1.53 - 3.45]	2.03***	[1.32 - 3.13]
Moderate limitations	4.35***	[3.03 - 6.24]	3.37***	[2.27 - 4.98]
Severe limitations	8.89***	[6.63 - 11.93]	6.12***	[4.18 - 8.94]

*** ***p<0.01***; ** ***p<0.05***; * ***p<0.1***

[a] Model without adjustment of variables

[b] Model adjusted by age, number of comorbidities, prescription drug insurance, regular source of care, any doctor visits in the last 12 months, any hospital stay in the last 12 months, and having no one to talk (isolation).

[c] Presence of litter, graffiti and vacant houses

Table 3.0-23 shows the unadjusted and adjusted logistic regression models for lung disease. Keys results for PNSC, street disorder and social services recipient were discussed above.

TABLE 3.0-23: LUNG DISEASE LOGISTIC REGRESSION MODELS - SOCIAL RISK FACTORS

	MODEL 1[a]		MODEL 2[b]	
	OR	**IC 95%**	**OR**	**IC 95%**
Age (years)	0.99	[0.98 - 1.00]	0.97***	[0.95 - 0.98]
Gender (Male)	0.80***	[0.69 - 0.93]	0.97	[0.80 - 1.18]
Race and Ethnicity				
White	1		1	
Black	0.95	[0.80 - 1.13]	0.68***	[0.55 - 0.84]
Hispanic	0.95	[0.71 - 1.28]	0.68**	[0.48 - 0.96]
Other	0.82	[0.56 - 1.22]	1.02	[0.62 - 1.68]
Marital Status				
Married or living together	1		1	
Separated or Divorced	1.52***	[1.22 - 1.90]	1.38**	[1.07 - 1.78]
Widowed	1.43***	[1.22 - 1.68]	1.36***	[1.08 - 1.70]
Never married	1.36	[0.84 - 2.20]	0.97	[0.54 - 1.76]
Education Status				
Less than High School	1		1	
High School	0.72***	[0.59 - 0.88]	0.78**	[0.61 - 1.00]
Some College	0.82*	[0.66 - 1.03]	0.92	[0.69 - 1.21]
Bachelor or superior	0.66***	[0.54 - 0.81]	0.92	[0.73 - 1.14]
Social services recipient	1.74***	[1.49 - 2.03]	1.39***	[1.12 - 1.72]
Neighborhood Social Cohesion				
High	1		1	
Moderate	1.21**	[1.01 - 1.44]	1.12	[0.92 - 1.37]
Low	1.51***	[1.25 - 1.82]	1.38***	[1.10 - 1.74]
Street disorder c	1.36**	[1.03 - 1.80]	1.52**	[1.11 - 2.09]
Walked for exercise last month	0.61***	[0.53 - 0.71]	0.69***	[0.59 - 0.81]
Functional status				
No Limitations	1		1	
Mild Limitations	1.32**	[1.02 - 1.71]	1.28*	[0.98 - 1.67]
Moderate limitations	1.75***	[1.37 - 2.22]	1.55***	[1.19 - 2.02]
Severe limitations	2.13***	[1.65 - 2.75]	1.63***	[1.18 - 2.26]

*** ***p<0.01***; ** ***p<0.05***; * ***p<0.1***

[a] Model without adjustment of variables

[b] Model adjusted by number of comorbidities, prescription drug insurance, regular source of care, any doctor visits in the last 12 months, any hospital stay in the last 12 months, and having no one to talk (isolation).

[c] Presence of litter, graffiti and vacant houses

CHAPTER 4: Summary and Discussion

4-1 Summary of Key Findings

Descriptive findings from this analysis demonstrate that American older adults frequently live with one or more cardiovascular risk factors. In fact, 56% of older adults show two or more cardiovascular risk factors. However, the burden of disease is not homogenous, as women and racial and ethnic minorities have a disproportionally higher burden of risk factors and CVDs. Additionally, women and racial minorities have higher rates of lower education attainment. This is important since educational attainment is protective for cardiovascular health of older adults: looking at ROCE score, there is an increased risk for those with less education. In fact, among people with less than high school, 21.9% are grouped as low ROCE compared with 29.7% of participants with bachelors or more education classified as low ROCE. Indeed, there is an education gradient in the low risk group, as education increases, more people are classified as low ROCE. A similar trend is observed in the high ROCE group but in the opposite direction: 43% of participants with the highest education attained are classified as high risk while this increases to 59.1% among people with the lowest level of education. These findings demonstrate that health inequalities persist during older adulthood. In fact, 20% of American older adults receive some type of social assistance and this is associated with worse cardiovascular health.

Regarding health care use, 95.2 % of NHATS respondents reported having a regular doctor they usually go to when they are sick or need health advice, and 93.1% had a doctor visit in the last 12 months. Both factors were associated with higher risk of being

in a high ROCE. Additionally, this research shows the social and built environments in which older adults reside affect cardiovascular health. In fact, older adults' risk of cardiovascular events increases gradually as their perceived neighborhood social cohesion decreases. The magnitude of this increase reaches up to 55% (OR 1.55 p=0.009) higher odds of belonging to a high risk of cardiovascular event group for adults living in neighborhoods with the lowest perceived social cohesion. This association remains after adjusting for other social risk factors like gender, race, education, being a social assistance recipient, being socially isolated, number of comorbidities, level of physical limitations, and having additional drug insurance.

Regarding the built environment, street disorder including litter in the streets, graffiti on the walls or the presence of vacant houses was associated with a 26% (OR 1.26 p=0.061) increases in odds of belonging to a high risk of cardiovascular event group after adjusting for co-variates. The analysis shows that 15.1% of older adults reported low levels of perceived social cohesion. There was a similar trend in both unadjusted and adjusted models when looking at the impact of perceived neighborhood social cohesion on individual cardiovascular risk factors and cardiovascular diseases The most significant associations of low perceived social cohesion with risk factors in adjusted models were found for diabetes (37% risk increase $p<0.001$), depressive symptoms (43% risk increase $p<0.001$), and, tobacco use (43% risk increase $p<0.001$), whereas central obesity and HBP did not show a significant association with PNSC.

The trends were similar for cardiovascular outcomes, but with lower significance. Perceived low social cohesion was associated with increased odds of reporting heart attack history (30% increase, $p<0.1$), a stroke (29% risk increase $p<0.1$) and with

reporting any other cardiovascular disease (22% risk increase $p<0.1$). In the case of reported pulmonary disease, low PNSC was associated with 38% increased odds ($p<0.001$). On the contrary, street disorder was associated with increased risk in all factors but lost its statistical significance after adjusting for co-variates. Only for lung disease was street disorder associated with increased risk by 52% ($p<0.05$).

4-2 Perceived Neighborhood Social Cohesion Usefulness in Clinical Care

These study results contribute to growing evidence that the built and social environment with neighborhoods play a key role in the health of older adults[91,95,97,102,106,109–111,116,131] and, specifically, in their cardiovascular risk.[93,98,113] This growing evidence couples with interest in improving measurement and detection of cardiovascular risk in clinical settings. Cardiovascular disease can be silent and debut without prodromes or early signs so early detection and prevention plays a key role[132–135]. In fact, 25% of heart attacks or sudden death happen in asymptomatic people.[20] The study results show that perceived neighborhood social cohesion is associated with higher odds of belonging to a high cardiovascular risk group. This result may provide useful information in clinical settings in two ways, first, by including PNSC screening in health records and secondly, including PNSC in the risk algorithms to identify patients at high risk.

While clinician's practices have generally focused on medical risk factors, there have been important steps towards increasing awareness about social risk factors and documentation of social determinants and their impact on health.[77,118,136–142] Indeed, in 2015 the American Heart Association made a significant statement that: "although we

have traditionally considered CVD the consequence of certain modifiable and non-modifiable physiological, lifestyle, and genetic risk factors, we must now broaden the focus to incorporate a third arm of risk, the social determinants of health. Failure to demonstrate awareness of this third dynamic will result in a growing burden of CVD, especially in those with the least means to engage in the healthcare system"[73]

This powerful position from the AHA has been accompanied by efforts to facilitate the task of collecting social and behavioral information in Electronic Health Records. The IOM Report, *Capturing Social and Behavioral Domains in Electronic Health Records*[87] was published in 2014 and it provides a rationale for the importance of collecting neighborhood characteristics in patients' records, reflecting that this information is useful and pertinent for providing appropriate health care. Information on neighborhood social cohesion might help clinicians to make better judgments and decisions about the treatments and preventive medicine interventions for each patient. For instance, patients living in areas of low PNSC are unlikely to engage in walking in their neighborhoods[143] and thus the preferred preventive intervention will need to be different. Without PNSC information, providers may be trying behavioral interventions that will be unlikely be adopted by many patients[105]. Instead, time could be used to create tailored preventive plans that adapt better to the patient's reality.

Another positive aspect of the PNSC score adapted from the Project on Human Development in Chicago Neighborhoods,[129] is it asks patients three simple and non-invasive questions: if people in their community know each other well, are willing to help each other, and can be trusted. This makes it a simple and feasible screening tool and therefore it might be more accepted by health care providers in settings with limited

resources and cardiovascular expertise. There might also be an economic incentive for health care providers to include PNSC and other social risk factors information since there is a growing interest in accounting for social aspects in Medicare payments to health care providers.[144]

Additionally, our results indicate that the PNSC impact in cardiovascular risk might be used for predictive and risk classification strategies. In order to assess cardiovascular risk, multiple risk algorithms have been developed, including the Framingham risk score[61], the American College of Sports medicine risk score[145], the ASSIGN score[123] in Scotland or the American Association of Cardiovascular and Pulmonary Rehabilitation algorithm for risk of cardiovascular event.[127] All of these scores are approaching risk assessment with a multivariable strategy, combining information from different risk factors since these interact and have a multiplicative effect on cardiovascular disease.[133–135] The overall strategy of applying a risk score is to combine both the presence of risk factors and the history or presence of cardiorespiratory and related diseases. Older adults show a high level of comorbidities[146–148] and therefore a vertical risk factors approach has limited applicability and composite measurements are particularly important in this population.[147] While there has been a major effort in building multivariable cardiovascular risk scores, their performance when predicting the absolute coronary risk in individuals is arguable. An evaluation of the Framingham score in British cohorts concluded that it systematically and significantly overestimated the individual risk.[149] However, the inaccuracy is not only in terms of estimation but also in terms of classification; another study conducted in a Scottish cohort showed that Framingham score tended to misclassify participants from more deprived contexts and assign them to lower risk groups.[123] It was also observed that

when building an algorithm that included social risk factors like SES, its predictive ability improved.[123] A systematic misclassification of people from deprived communities is troublesome since it can translate into perpetuating health inequalities. However, just one of the risk algorithms previously mentioned, the ASSIGN from Scotland, goes beyond biomedical or classic risk factors. The importance of taking into account the role of social risk factors in cardiovascular disease has been discussed for the last 11 years. The British Medical Journal's Heart journal editorial, *The value of risk scores* by J S Jürgensen,[20] alerted researchers that additional casual factors need to be considered beyond biomarkers and behavioral points when building cardiovascular risk scores. Jürgensen argues that the interaction of biological factors with social characteristics is an opportunity to refine our risk prediction and classification. He continues that at a societal level we cannot confine the effort only to the health care system, but must tackle risk factors having high attributable risk, seeking a more equitable resource distribution. The experience in Scotland, where the ASSIGN risk score adds social deprivation and family history to cardiovascular risk assessment[123] is promising, yet insufficient.

In summary, it seems PNSC may be an ideal candidate to test for inclusion both in the medical record and in risk algorithms: it has already shown association with stroke,[113] myocardial infarction,[93] walking,[143] and preventive medicine use.[92] Moreover, it does not require any additional clinical test and can be applied in health care settings with limited resources and cardiovascular expertise and it collects information about the social environment of patients, which simultaneously affect many risk factors. From the patient's perspective, it might feel less invasive to screen for neighborhood social

cohesion than capturing other social risk measurements like income or financial security, however this would need further research.

4-3 Prevalence of Social Risk Factors and Preventive Medicine Interventions

This study reveals that the majority of the older population in the United States frequently contacts the health system in a similar pattern as previously reported;[150] 93.1% of older adults had a doctor visit in the last 12 months and 20.4% were admitted in the hospital. Those contacts with the health care system can be seen as opportunities to do preventive medicine, in fact *The Medicare Preventive Services Demonstration* in Baltimore,[151] showed that nearly two thirds of beneficiaries took advantage of the opportunity to have at least one annual preventive visit with their primary care physician over a 2-year period.[151] This preventive window of opportunity for older adults is very important: a study about physical activity for Medicare beneficiaries showed that 40% of older adults who initiated exercise considered their physician a very important influence.[152]

There is indeed a growing interest from the preventive medicine field to increase the number of preventive recommendations for older adults. In 2005, the USPSTF created a specific geriatrics working group to refine USPSTF methodology and processes to "better address the preventive needs of older adults."[40] Nevertheless, there is still room for further development. Currently there are just two USPSTF preventive medicine recommendations (out of 98) that target older adults specifically: screening of cognitive impairment and falls prevention, counseling and preventive medication.[153] Furthermore, the USPSTF geriatrics working group reported in 2010 that recommending preventive services for older adults was highly problematic since "adverse clinical effects that affect

the geriatric population are multifactorial in nature and require interventions with multiple and sometimes disparate components."[40]

In addition, older adults and people with comorbidities are generally excluded from RCTs (the scientific gold standard for USPSTF). For instance, our study shows that 56.4% of adults older than 65 years old live with two or more modifiable cardiovascular risk factors (namely HBP, central obesity, diabetes, tobacco use and depressive symptoms). If we considered being older than 65 years a risk factor itself, as many risk scores do[134,154] this percentage reaches 91.7% of our nationally representative cohort of older adults. So, it is indeed a population showing high complexity due to their multi-morbidity and an invisible population for RCTs. Moreover, the results of our research show significant associations between perceived neighborhood social cohesion, street disorder and being a recipient of social assistance with cardiovascular health. A large body of research supports the role of those social variables in the occurrence and management of cardiovascular risk factors. In 2016 an extensive review by Diez Roux reported numerous scientific studies linking neighborhood impact on cardiovascular health through various pathways like diet, physical activity and stress.[105] In addition, recent research shows that people reporting high social cohesion in their neighborhoods tended to seek more preventive care like mammograms,[155] flu shots, or pap smears.[156]

This evidence is definitely important to take into account in order to inform preventive medicine recommendations that better respond to the needs and the reality of older adults. If the health of older adults has a strong social component, the preventative care must take it into account. In words of Ataguba and Mooney: "conceptually,

prevention can include activities and improvements in the social determinants of health, such as reductions in poverty and inequalities, and increased access to education." [157] Otherwise we might develop preventive policies that, by ignoring the social determinants of health, have unintended consequences of intensifying existing disparities. The fact that neighborhood social cohesion plays an important role in health shows how wellbeing has an important community dimension. So, it is not only useful to take into account the social characteristics of an individual in tailoring preventive medicine recommendations for that person, but to consider that the community an important target for preventive interventions. There is indeed an extensive body of evidence linking "healthy aging" with healthy environments.[158,159]

In fact, the WHO's initiative "Age-friendly environments" is developing a Global network for age-friendly cities and communities,[160] recognizing that the community where people age plays a key role in the prevention of negative aging experiences. By designing and recommending community-based preventive interventions it is more likely that we will be able to target those "disparate components of adverse clinical events in older adults" mentioned above.[161] In this sense, NHATS and other nationally representative studies are rich sources of information for identifying missed opportunities or open niches not only for individual primary, secondary or tertiary prevention but also identify needs for primordial prevention. Primary Prevention is defined as: " intervention measures to prevent the occurrence (incidence) of disease, disability, or injury".[162] Secondary prevention is defined as: "set of measures used for early detection and prompt intervention to control a problem or disease (prevalence) and minimize the consequences". [162] Finally, tertiary prevention "focuses on the reduction of further

complications of an existing disease, disability, or injury, through treatment and rehabilitation". [162] Besides this prevention definition, there is the concept of primordial prevention, coined by Toma Strasser who wrote: "The spread of risk factors is a social-behavioral phenomenon deriving from economic, social cultural, politically-briefly, historical-happenings. It is unlikely that a handful of prevention-minded cardiologists can influence the human macrocosms, unless their message is heard and understood by health policy makers and politicians. And it is not unthinkable that the difficulties of communicating the message might be overcome. This can be considered part of the "problematique humaine". Primordial prevention of cardiovascular diseases definitely goes beyond cardiology and beyond medicine".

4-5 Significance for Research and Policy

Next steps in Geriatric Preventive Medicine in the U.S.: Research

Currently, RCT findings are seen as providing the scientific gold standard for recommending the adoption of preventive services by the USPSTF. However, some authors argue that the current strategies to inform preventive medicine interventions in elderly people need to change in order to adapt to the reality of health and aging. Friedland and Nandi illustrate this point with their editorial: "A modest proposal for a longitudinal study of dementia prevention (with apologies to Jonathan Swift, 1729)".[163] The purpose of the editorial was to provide incisive commentary on systematic review that had been published regarding interventions of modifiable risk factors to reduce risk of dementia. The initial review concluded that a lack of clinical trials impedes support for

any specific interventions to impact dementia risk factors. [164] In response, Friedland and Nandi propose what is in essence a nonsensical experiment – a 40-year single blind study of 10,000 adults aged 20-30 wherein healthy volunteers are randomly assigned to groups that experience smoking, diets high in saturated fats, and head injuries. They conclude: "But can such a study be done? It is time to realize that the ultimate study of the interactions of interest in regard to lifestyle and cognitive health in aging cannot be done. Yet the absence of definitive evidence should not restrict physicians from making reasonable recommendations."[163] The point of this commentary is to prompt the field to make reasonable recommendations for interventions, even in the absence of RCTs, which as they comically demonstrate, are not necessarily feasible.

There are further problems with primary reliance on clinical trials. This is the perspective of Barbara Starfield et al. in the manuscript: "The concept of prevention: a good idea gone astray?"[14] where they argue interventions "to reduce excess risk, while useful based on statistical associations in clinical trials, may not be useful in other population groups not included in the trial." Clinical trials may not be the best tool to inform preventive policies for the general population in the first place. Not only are older adults often excluded from clinical trials,[165] but certain population groups are often not included either. By design, clinical trials exclusion criteria systematically targets certain populations: women,[166] racial and ethnic minorities,[165] HIV patients,[167] depressed patients and more. Therefore, it is problematic to generalize the results of clinical trials to generate policies and interventions targeting the entire populations (e.g., older adults).[14] Starfield et al. also made the point that the vertical preventive approach considers risk as independent, which for CVDs has been proven to be the opposite.[133–135] Finally,

numerous authors agree that prevention policies should aim to reduce health inequalities by targeting the population attributable risks and not individual risk.[20,14] In the words of Geoffrey Rose: "To find the determinants of prevalence and incidence rates, we need to study characteristics of populations, not characteristics of individuals".[168]

According to this perspective, the nature of aging requires a different methodology to generate knowledge than what preventive medicine research has traditionally used. There is a call questioning the feasibility of conducting clinical trials for older adults' health problems and a call for action towards the identification of reasonable recommendations that can improve older adults' quality of life.[163] If indeed the type of scientific evidence currently required to inform preventive medicine interventions in the elderly is not feasible, we should change our methodological strategy without compromising the health benefits that many generations could get from preventive medicine. In the absence of clinical trials we might use other types of studies like epidemiological studies to observe how modifiable risk factors behave in the elderly,[169] especially using representative populations. Regarding epidemiological studies, the National Health and Aging Trends Study (NHATS) combines a unique set of questions to capture the reality of aging in the US, combining medical, social, physical, and other dimensions of the process. NHATS aligns with the key strategy of Prevention science, a "relatively new field" that has an interdisciplinary approach combining life-course development, community epidemiology, and preventive intervention perspectives[169]. The scholarly discourse of prevention needs to generate recommendations for the older adult population using a feasible methodology. Questions that should be asked include: What are the primary health determinants for older adults in

the U.S.? How can knowledge of social risk factors be included in prevention methodology and recommendations? Answers to these questions should be used to guide future research to better meet preventative care needs of older Americans.

Next steps in Geriatric Preventive Medicine in the U.S.: Policy Challenges

The aging phenomenon is making healthcare systems face some important shortcomings. In fact, aging offers a unique opportunity to strengthen our healthcare systems. Moreover, preventive medicine policies play an important role to ensure both the sustainability and the efficacy of our healthcare system when taking care of older adults' health needs.[170,171] In a clear recognition of this, the ACA covers free of charge USPSTF recommendations with grade A or B of evidence.[38] Although this is an unprecedented impulse for the preventive medicine field, preventive medicine for older adults is facing important challenges. It is difficult to develop preventive recommendations for older adults since it "requires interventions with multiple and sometimes disparate components"[40] and as described, older adults are not included in RCTs.[165] These challenges also pose an opportunity to strengthen the field of geriatric preventive medicine. Geriatric preventive policies need to adequately integrate the key components of aging: social, environmental, psychological and biological aspects. Developing geriatric preventive medicine policies involves, indeed, integration in the broadest sense of the word. This section will identify three valuable dimensions of knowledge integration that could inform the development of effective policies for prevention in this population.

First, preventive medicine policies would benefit from the integration of both the knowledge and research scope on social risk factors and their impact on the health and behaviors of older adults[32,38,113]. Social risk factors and particularly neighborhood social and built environment play a crucial role in older adults' health.[91,95,97,102,106,109–111,116,131] Integration of this evidence into the design of preventive medicine policies is important to respond to the needs of older adults. Not integrating social risk factors into preventive medicine policies might turn into inefficiencies and unintended consequences like intensifying existing health disparities.

Secondly, preventive medicine policies would benefit from the integration between health care and public health systems. Integration between health care and public health systems has been advocated from multiple voices.[170,171] Building more comprehensive preventive medicine policies facilitates coordination between public health and health systems. Our research shows that recipients of social assistance are at higher risk of a cardiovascular event; however, the social care system does not communicate nor is it coordinated with the health care system. Preventive medicine is unique since it has both a clinical and a public health component, which makes it a key actor for this coordination effort. Coordination between public health and healthcare systems is important to avoid fragmented and costly care delivery,[173,171] especially for the management of chronic conditions and multi-morbidity, both common situations among older adults.[171]

Finally, integration of older adults in our research methodologies is necessary. Exclusion of older adults from RCTs is troublesome: older adults are a growing segment

of our population, and we need specific surveillance, monitoring and research strategies to adequately understand their health needs. To meet those needs it might be necessary to develop specific methods beyond RCT to better reflect their reality. [163]

As a final point, in a more philosophical vein, integration of older adults into society should be a goal[1] of our health and public policies. One of the main obstacles for older adult's integration is the negative ageing stereotype and the ageism. Ageism occurs in a societal level both implicitly and explicitly[170,174–176]. Developing specific policies to increase social awareness about ageism is important to improve older adult's integration. Additionally, developing preventive policies targeting not only individuals but communities would prevent diseases while also increasing social cohesion and preventing isolation, exclusion and discrimination of older adults. This is a worthy goal of our healthcare and public health systems, and requires a reorientation about the value of aging as a stage in the life course.

4-6 Study Strengths and Limitations

A contribution of the present study is the use of population-based data to identify key social risk factors for cardiovascular health in older adults, aiming to inform preventive medicine interventions. This study helps explain how social risk factors, namely perceived neighborhood social cohesion, impacts cardiovascular health in older adults. The approach to CVD in this study is innovative for a number of reasons. First, it includes depressive symptoms in the cardiovascular risk equation. Second, cardiovascular risk factors are studied together. Cardiovascular risk factors co-occur in older adults and this research aims to study people's health as they actually present in the doctor's office. Additionally, the risk score is based in a mix of self-reported, measured and screened

components, which increases the probability of capturing risk factors. This risk score is an inexpensive tool since it does not require of complex technology so it might be interesting to further study its applicability for older adult's risk stratification in low resource settings.

This study also has important limitations to be taken into account. First, our main dependent variable, risk of cardiovascular event (ROCE), was constructed partially based on self-reported measures, which could potentially introduce information bias. Second, as with any observational analysis there is potential for residual confounding in this study. There are also limitations based on the reverse causality, competing risks and generalizability of findings to underrepresented minorities or rural populations, which are discussed below.

Information bias: Since some variables are self-reported (HBP, Diabetes, Tobacco use and CVDs) there is a greater chance of observing underreporting of certain diseases. Regarding tobacco use, there is a limitation in the information since 'number of cigarettes' is not included in our study, nor is ex-smoker status. Moreover, this information bias may be associated with important confounders such as gender. Similarly, we might observe recall bias associated with cognitive status. A second aspect of information bias is that most cardiovascular research in the literature has been conducted in non-elderly populations.

Confounders: As with any observational analysis there is potential for residual confounding in this study. We identified as potential confounders social risk factors like race, sex, education and financial insecurity. Financial insecurity was accounted by being a recipient of social services/assistance and street disorder. Additionally, two adjusting

variables from the health insurance section (having an additional drug insurance and type of insurance) provides further information about financial security. Regarding loneliness, respondents reporting no one in their network and no one to talk to were identified and all models were adjusted for that.

Reverse causality: While we observe that walking is an exercise and is associated with reduced odds of ROCE, as in any observational study, there is the potential for reverse causality.

Survival bias: populations exposed to lower neighborhood social cohesion might have lower life expectancy than otherwise and that might bias our results underestimating the impact of Social Risk Factors.

Measurement limitations: Waist circumference was measured by an interviewer and in some cases, it was self-measured. This can introduce bias since measurements may be different. There were also limitations to the quality of measurement among respondents wearing bulky clothes.

Generalizability limitations: minority populations like Hispanics have small numbers in this study, so we may need larger samples to derive specific conclusions for those populations. Additionally, we are not considering rural vs. urban settings and that can affect how neighborhood social cohesion is constructed.

Conclusions

Societies are experiencing a crucial change regarding their age composition worldwide. This phenomenon, the aging of the population, is not solely determined by the increase of life expectancy but also by social, political and environmental

determinants. In the United States the magnitude of aging is large, by 2050 there will be nearly 100 million Americans older than 65 years. Given the size of this population it will be challenging to assure they receive quality health and social care. Among their health care needs, their cardiovascular health is of particular importance since cardiovascular diseases are the most common cause of death and disability worldwide. Therefore, preventing cardiovascular diseases is of special importance in this population. Unfortunately, the preventive medicine policies targeting cardiovascular diseases in American older adults are still scarce. In fact, the evidence of interventions targeting older adults is less than desired since they are systematically excluded from randomized clinical trials. Not only that, but also cardiovascular diseases are affected by social and environmental factors which are not accounted for in randomized clinical trials. Indeed, there is a scientific consensus about how cardiovascular health is impacted not only by classic risk factors like obesity or tobacco use, but also by environmental and social risk factors. This dissertation examines cardiovascular risk factors related to the neighborhoods' social and built environment where American older adults live. Regarding social aspects, it analyzes how gender, race, social assistance and perceived neighborhood social cohesion are associated with cardiovascular risk. In terms of the built environment, street disorder is the analyzed variable. The results show that social aspects like low perceived neighborhood cohesion, being recipient of social assistance and living in an area with increased street disorder are associated with increased cardiovascular risk among American older adults. Taking into account this association could help in the development of efficient and equitable preventive medicine policies with the goal of maintaining good health status during the later years of life. Additionally,

reconsidering the methodology to inform preventive medicine interventions is needed and of interest to older adult populations. The limitations of randomized controlled trials is clearly evident. The use of epidemiological studies can provide a comprehensive source of information for the older population's health and useful tools for developing and evaluating preventive medicine policies and interventions. The goal is to achieve a better quality of life for American older adults.

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Paloma Navas Gutiérrez, MD, PhD, MPH

EDUCATION & HONORS

Ph.D. in Health Policy and Management, **Johns Hopkins Bloomberg School of Public Health**, Baltimore, MD (2011 – 2017)
Dissertation: "Meeting the preventative care needs of American older adults: identifying key social risk factors for cardiovascular health"

- Fulbright Scholarship (2010- 2016) <5% admissions

Certificate in Research Methodology, **Universidad Autónoma de Barcelona**, Distance Learning (2010)
Training Scholarship at WHO Collaborating Center Ivo di Carneri for "Management of Programs for Communicable Diseases Control in Sub-Saharan Africa", Tanzania 2011

Master of Public Health, **National School of Health, Carlos III Health Institute**, Madrid, Spain (2008)

- Capstone Project: "The social determinants of health in the European project for health indicators."
- Expat delegate (2007) for University of Dakar and NGO Health Cooperation and Aid Project, Senegal

Medical Doctor, **University Autónoma de Madrid (UAM) School of Medicine**, Madrid, Spain (2005)

- Elected to UAM Government Council (2006-2007) – representing >8000 students
- Banco Santander Scholarship (2004-2005) – for study abroad at the University of Puerto Rico Medical School
- Erasmus Scholarship (2003-2004) – for study abroad at Dresden University of Technology, Germany
- Expat delegate (2002) for international cooperation project at Sangmelima Hospital, Cameroon

PROFESSIONAL EXPERIENCE

Assistant Professor, **University Autónoma de Madrid School of Medicine**, Madrid, Spain (2005-Present)

- Assist curriculum development for introductory health care management & economics course
  (3 ECTS, 13 editions, 300 students to date, graduate level)
- Teachings focus on comparative health systems, including US health care reform, aging and chronic diseases in the ACA, health disparities

Consultant and technical writer, 3M Health Information Systems, International Business Unit, CT, USA (2014-2015)

- Diagnostic Related Group implementation in international health systems
- Findings report to customers; design and edition of instructions manuals

- Harmonization of Diagnostic Codes Systems with the International Classification of Diseases versions 9 and 10

Managing Editor, **International Journal of Health Services** (2013-2015)
- Review article submissions and communications with authors and reviewers
- Manage copyright agreements and assist in layout of quarterly publications

Medical Specialist, Health Care Services of Castilla la Mancha (2007-2011)
Preventive Medicine & Public Health
- **Spanish National Cohort on HIV**, National Center of Epidemiology Carlos III Institute, Madrid, Spain (2011)
- **"Prudent Use of Antibiotics"** ECDC Campaign, Guadalajara, Spain (2010) – trained 30+ health care center coordinators
- **WHO Hand Hygiene Day Campaign**, University Hospital 12 de Octubre, Madrid, Spain (2009) – trained 700+ health professionals over 2-day campaign; received distinction from Hospital Infection Prevention Committee
- Manage control and surveillance of health care related infectious diseases, including multi-drug resistant organisms
- Led response to 2 community outbreaks (MRSA and Acinetobacter baumanii) and H1N1 pandemic

LEADERSHIP EXPERIENCE

Selected leadership experiences in Education & Community:
- Tutor, **Incentive Mentoring Program**, Baltimore, MD (2013-Present) – tutor and mentor inner city teenagers in exclusion risk
- **European Project for Harmonization of Medical Education**, UAM, Madrid, Spain (2006) – project design and management
- Founder, ***"La Pajarera"* Volunteering Program at *La Paz* Pediatric Hospital**, Madrid, Spain (2000) – managed team of 30+ volunteers in activities supporting pediatric oncology patients, 3000+ children and families served to date.
- National Coordinator in Public Health, **International Federation of Medical Students Associations in Spain** (1999-2003) – worked with 30 local public health officers on projects benefiting medical students; representative at General Assemblies in Estonia, Netherlands and Venezuela

ADDITIONAL INFORMATION

Language: Spanish (native), English (proficient), German French/Italian/Portuguese

(basic-intermediate)